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1982 BUDGET EXPLANATORY NOTES



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U.S. DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION

SCIENCE AND EDUCATION ADMINISTRATION

Purpose Statement

The Science and Education Administration (SEA) provides overall coordination, planning and support for food and agricultural science and education programs. It conducts and supports research across the broad range of food and agricultural sciences, including human nutrition. SEA communicates and demonstrates the results of this research to farmers, processors, consumers, and other groups. It provides facts and expertise in support of the policy and regulatory functions and of "action" programs of the Department of Agriculture and other government agencies. Other work includes developing and maintaining library and computer information systems to assist the public, researchers, and educators. SEA also responds to international food and agriculture needs through research and education.

SEA enables the USDA to carry out more effectively the "lead agency" role assigned to it by the Food and Agriculture Act of 1977. SEA units include Agricultural Research, which conducts basic and applied research at more than 150 locations in the U.S. and overseas; Cooperative Research, which makes funds available to State agricultural experiment stations and other cooperating institutions and participates in a nationwide system of research program planning and coordination between the States and the U.S. Department of Agriculture; Extension, which works in partnership with the Cooperative State Extension Services and their county agents in 3,150 offices across the country; Technical Information Systems, which maintains a permanent collection of materials on food and agriculture and helps the public use a vast library and computerized information retrieval system; and Human Nutrition, which directs and coordinates Federally funded research in human nutrition. SEA's Joint Program Planning and Evaluation Staff coordinates priority programs like energy, human nutrition, and natural resources through special project leaders working with regular program managers; organizes and carries out policy and program evaluations and impact analysis of SEA programs requested by the office of the President, the Secretary of Agriculture, the Congress, and other government agencies. It also provides support to two top advisory bodies created by the Food and Agriculture Act: The Joint Council on Food and Agricultural Sciences and the National Agricultural Research and Extension Users Advisory Board.

SCIENCE AND EDUCATION ADMINISTRATION

Available Funds and Staff-Years

1980 and Estimated 1981 and 1982

Item	Actual, 1980		Estimated Available		Budget Estimate	
	:Staff-:		:Staff-:		:Staff-:	
	Amount	Years	Amount	Years	Amount	Years
Direct Appropriation:						
Agricultural Research.....	\$372,970,000	8,725	\$432,549,000	8,983	\$ 456,881,000	8,983
Building & Facilities.....	- -	- -	- -	- -	1,900,000	- -
Cooperative Research.....	186,031,000	95	201,083,000	105	232,476,000	105
Extension.....	274,023,000	160	292,540,000	194	305,110,000	194
Higher Education.....	11,500,000	- -	11,500,000	- -	- -	- -
Technical Info. Systems.....	7,917,000	206	8,930,000	212	9,381,000	212
Total, Direct Appropriation.....	852,441,000	9,186	946,602,000	9,494	1,005,748,000	9,494
Deduct Allotments to other Agencies:						
Forest Service.....	-292,000	-1	-389,000	-2	-390,000	-2
Net.....	852,149,000	9,185	946,213,000	9,492	1,005,358,000	9,492
Obligations from other USDA Appropriations:						
Agricultural Research....	7,236,819	152	9,391,000	152	9,391,000	152
Cooperative Research....	18,983	- -	- -	- -	- -	- -
Extension.....	2,368,160	- -	2,595,000	- -	2,595,000	- -
Technical Info. Systems...	287,000	7	292,000	7	292,000	7
Total, Other USDA Appropriations.....	9,910,962	159	12,278,000	159	12,278,000	159
Total, Agriculture Appropriations:						
Appropriations.....	862,059,962	9,344	958,491,000	9,651	1,017,636,000	9,651
Other Federal Funds:						
Agricultural Research....	10,812,776	60	14,531,000	60	14,531,000	60
Cooperative Research....	2,143,012	- -	3,080,000	- -	3,080,000	- -
Extension.....	652,680	- -	800,000	- -	800,000	- -
Total, Other Federal Funds.....	13,608,468	60	18,411,000	60	18,411,000	60
Non-Federal Funds:						
Agricultural Research....	3,075,679	34	3,595,000	34	3,595,000	34
Extension.....	555,160	- -	875,000	- -	875,000	- -
Technical Info. Systems...	50,000	- -	59,000	- -	59,000	- -
Total, Non-Federal Funds.....	3,680,839	34	4,529,000	34	4,529,000	34
Total, Science and Education.....	879,349,269	9,438	981,431,000	9,745	1,040,576,000	9,745

	1980 Actual	1981 Estimated	1982 Estimated
Permanent Full-time:			
Agricultural Research.....	7,689	7,843	7,843
Cooperative Research.....	86	95	95
Extension.....	148	180	180
Technical Info. Systems...	179	182	182
Total, Permanent Full-time.....	8,102	8,300	8,300

Other than Permanent:

Agricultural Research.....	1,205	1,308	1,308
Cooperative Research.....	8	9	9
Extension.....	10	12	12
Technical Info. Systems...	<u>23</u>	<u>26</u>	<u>26</u>
 Total, Other.....	 1,246	 1,355	 1,355
 Non-Ceiling:			
Agricultural Research.....	76	76	76
Cooperative Research.....	1	1	1
Extension.....	2	2	2
Technical Info. Systems...	<u>11</u>	<u>11</u>	<u>11</u>
 Total, Non-Ceiling....	 90	 90	 90
Total <u>1/</u>	<u>9,438</u>	<u>9,745</u>	<u>9,745</u>
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1/ Excludes staff years worked on overtime.

SCIENCE AND EDUCATION ADMINISTRATION

Permanent Positions by Grade and Staff-Year Summary

1980 Actual, 1981 Estimate and 1982 Estimate

- 147 -

Grade	1980 Actual			1981 Estimate			1982 Estimate		
	Headquarters: Field	Total	Headquarters : Field	Total	Headquarters : Field	Total	Headquarters : Field	Total	Headquarters : Field
ES-6	4	-	4	-	4	-	4	-	4
ES-5	6	4	10	6	10	4	6	4	10
ES-4	13	20	33	13	20	33	13	20	33
ES-3	3	1	4	3	1	4	3	1	4
ES-2	2	-	2	-	2	-	2	-	2
ES-1	6	9	15	6	9	15	6	9	15
GS-17	3	1	4	3	1	4	3	1	4
GS-16	4	5	9	4	5	9	4	5	9
GS-GM-15	121	314	435	121	314	435	121	314	435
GS-GM-14	109	606	715	109	605	714	109	605	714
GS-GM-13	105	955	1,060	104	953	1,057	104	953	1,057
GS-12	122	758	880	120	756	876	120	756	876
GS-11	114	590	704	113	588	701	113	588	701
GS-10	3	7	10	3	7	10	3	7	10
GS-9	64	722	786	63	720	783	63	720	783
GS-8	18	150	168	18	150	168	18	150	168
GS-7	106	820	926	105	819	924	105	819	924
GS-6	217	316	533	217	316	533	217	316	533
GS-5	157	761	918	157	759	916	157	759	916
GS-4	68	440	508	68	437	505	68	437	505
GS-3	35	107	142	35	104	139	35	104	139
GS-2	7	11	18	7	11	18	7	11	18
GS-1	2	1	3	2	1	3	2	1	3

Permanent Positions by Grade and Staff-Year Summary

1980 Actual, 1981 Estimate and 1982 Estimate (Continued)

Grade	1980 Actual			1981 Estimate			1982 Estimate		
	Headquarters	Field	Total	Headquarters	Field	Total	Headquarters	Field	Total
Grade Established									
under Foreign									
National Pay Plan.....	- -	25	25	- -	31	31	- -	31	31
Ungraded Positions....	20	1,220	1,240	20	1,218	1,238	20	1,218	1,238
Total Permanent									
Positions.....	1,310	7,850	9,160	1,304	7,836	9,140	1,304	7,836	9,140
Staff Years:									
Permanent.....	1,080	7,022	8,102	1,165	7,135	8,300	1,165	7,135	8,300
Other.....	157	1,089	1,246	120	1,235	1,355	120	1,235	1,355
Non-Ceiling.....	16	74	90	16	74	90	16	74	90
Total.....	1,253	8,185	9,438	1,301	8,444	9,745	1,301	8,444	9,745

SCIENCE AND EDUCATION ADMINISTRATION

CLASSIFICATION BY OBJECTS

1980 and Estimated 1981 and 1982

	<u>1980 Actual</u>	<u>1981 Estimated</u>	<u>1982 Estimated</u>
Personnel Compensation:			
Headquarters.....	\$ 27,894	\$ 31,199	\$ 31,940
Field.....	<u>179,990</u>	<u>202,768</u>	<u>204,457</u>
11 Total Personnel Compensation.....	207,884	233,967	236,397
12.0 Personnel Benefits Civilian 1/.....	<u>44,579</u>	<u>48,572</u>	<u>50,818</u>
Total Pers. Comp. & Benefits.	<u>252,463</u>	<u>282,539</u>	<u>287,215</u>
Other Objects:			
21.0 Travel and transportation of persons.....	5,433	8,172	9,044
22.0 Transportation of things.....	1,047	1,267	1,322
23.1 Standard level user charges.....	4,107	3,735	4,746
23.2 Communications, utilities and other rent.....	33,612	36,617	39,621
24.0 Printing and reproduction.....	2,407	2,713	2,990
25.0 Other services.....	63,302	70,029	94,418
26.0 Supplies and materials....	34,154	38,944	42,426
31.0 Equipment.....	21,835	26,976	30,030
32.0 Lands and structures.....	14,808	22,017	25,716
41.0 Grants, subsidies, and contributions.....	<u>416,124</u>	<u>448,144</u>	<u>475,670</u>
Total other objects.....	<u>596,829</u>	<u>658,614</u>	<u>725,983</u>
Total obligations.....	<u>849,292</u>	<u>941,153</u>	<u>1,013,198</u>

Position Data:

Average Salary, ES positions	\$ 50,112.50	\$ 50,112.50	\$ 50,112.50
Average Salary, GS positions	\$ 24,586	\$ 27,092	\$ 27,092
Average Grade, GS positions	9.48	9.48	9.48
Average Salary of Ungraded positions.....	\$ 17,597	\$ 19,787	\$ 19,787

1/ Includes retirement and compensation costs for extension agents.

SCIENCE AND EDUCATION ADMINISTRATION

Appropriation Act, 1981.....	\$ 929,438,000
Budget Estimate, 1982.....	1,005,748,000
Increase in Appropriation.....	<u>+ 76,310,000</u>

Adjustments in 1981:

Appropriation Act, 1981.....	\$ 929,438,000
1981 Supplemental Appropriation for pay costs.....	<u>+ 17,164,000</u>
Adjusted base for 1982.....	946,602,000
Budget estimate, 1982.....	1,005,748,000
Increase over adjusted 1981.....	<u>+ 59,146,000</u>

SUMMARY OF INCREASES AND DECREASES
(on basis of adjusted appropriation)

<u>Item of Change</u>	<u>1981 Estimated</u>	<u>Program Changes</u>	<u>1982 Estimated</u>
SEA Unit:			
Agricultural Research.....	\$420,449,000	+\$36,432,000	\$ 456,881,000
Cooperative Research.....	201,083,000	+ 31,393,000	232,476,000
Extension.....	304,040,000	+ 1,070,000	305,110,000
Technical Information Systems.....	8,930,000	+ 451,000	9,381,000
Subtotal.....	934,502,000	+69,346,000	1,003,848,000
Construction.....	12,100,000	-10,200,000	1,900,000
TOTAL AVAILABLE.....	<u>946,602,000</u>	<u>+59,146,000a/</u>	<u>1,005,748,000</u>

a/ Includes a total increase of \$46,816,000 toward increased operating costs
in order to sustain performance levels for continuing programs.

Includes a total increase of \$3,862,000 for the portion of pay increases
effective in FY 1981 which were absorbed in FY 1981 but which are necessary
to carry out the programs proposed in FY 1982.

Science and Education Administration research and extension activities have been
reviewed and evaluated on an agency-wide basis. The table below shows changes,
on an activity basis, proposed for FY 1982 over FY 1981.

	<u>Budget Authority</u> (dollars in thousands)			<u>Change 1981 to 1982</u>
	<u>1980</u>	<u>1981</u>	<u>1982</u>	
Crop Productivity.....	\$150,194	\$170,223	\$187,668	+\$17,445
Crop Protection.....	104,164	119,732	133,733	+ 14,001
Animal Productivity.....	70,335	74,213	78,916	+ 4,703
Animal Protection.....	74,653	80,518	80,969	+ 451
Food Quality and Safety.....	49,703	54,485	60,771	+ 6,286
Food Protection, Distribution & Exports.....	33,623	36,864	39,099	+ 2,235
Technology and Safety of Non-food Agricultural Products.....	27,510	30,792	27,053	- 3,739
Economics, and Farm Management....	17,873	18,949	19,046	+ 97
Human Nutrition.....	81,952	89,268	98,746	+ 9,478
Family and Consumer Development....	43,165	45,501	47,008	+ 1,507
Youth Development (4-H).....	73,735	78,746	82,600	+ 3,854
Rural and Community Development....	26,964	29,231	30,203	+ 972
Land and Water Resources.....	64,969	72,717	82,801	+ 10,084
Forestry and Range Resources.....	22,778	25,350	26,871	+ 1,521
Technical Information Systems.....	<u>7,917</u>	<u>8,930</u>	<u>9,381</u>	+ 451
Subtotal.....	849,535	935,519	1,004,865	+ 69,346
Construction (non-recurring).....	3,900	12,100	1,900	- 10,200
Total a/.....	<u>853,435</u>	<u>947,619</u>	<u>1,006,765</u>	<u>+ 59,146</u>

1890 Facilities (Proposed Legislation)	10,000b/	10,000b/
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Specific justification of increases and decreases within these totals are described in the following sections of these explanatory notes.

- a/ Includes \$994,000 for FY 1980, \$1,017,000 for FY 1981 and FY 1982 for Miscellaneous Contributed Funds.
- b/ Includes \$10 million which (subject to Congressional approval of proposed authorizing legislation) would provide the initial Federal funding for a 5-year 1890's and Tuskegee Institute research facilities improvement program totalling \$50 million.

SCIENCE AND EDUCATION ADMINISTRATION
AGRICULTURAL RESEARCH

Purpose Statement

Agricultural Research was established on November 2, 1953, pursuant to authority vested in the Secretary of Agriculture by 5 U.S.C. 301 and Reorganization Plan No. 2 of 1953, and other authorities.

The research performed by Agricultural Research (AR) is authorized by the Department of Agriculture Organic Act of 1862 (5 U.S.C. 511), the Research and Marketing Act of 1946, as amended (7 U.S.C. 427,4271), and the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (P.L. 95-113).

Agricultural Research is responsible for conducting basic, applied and developmental research of:

- Animal production
- Plant production
- Use and improvement of soil, water, and air
- Processing, storage, distribution, food safety, and consumer services
- Human nutrition research

The research applies to a wide range of goals; commodities; natural resources; field of science; and geographic, climatic, and environmental conditions. It is categorized into 67 AR National Research Programs and eight Special Research Programs.

As the U.S. Department of Agriculture's in-house agricultural research unit SEA/AR has major responsibilities for conducting and leading the national agricultural research effort. SEA/AR provides initiative and leadership in five areas:

- * Research on broad regional and national problems.
- * Research to support Federal action and regulatory agencies.
- * Expertise to meet national emergencies.
- * Research support for international programs.
- * Scientific resource to the Executive Branch and Congress.

The mission of AR research is to develop new knowledge and technology which will insure an abundance of high quality agricultural commodities and products at reasonable prices to meet the increasing needs of an expanding economy and to provide for the continued improvement in the standard of living of all Americans. This mission focuses on the development of technical information and technical products which bear directly on the needs to (1) manage and use the Nation's soil, water, air, and climatic resources, and improve the Nation's environment; (2) provide an adequate supply of agricultural products by practices that will maintain a permanent and effective agriculture; (3) improve the nutrition and well-being of the American people; (4) improve living in rural America; (5) strengthen the Nation's balance of payments; and (6) promote world peace.

Research is conducted at numerous field locations in the States, District of Columbia, Puerto Rico, the Virgin Islands, and in several foreign countries. Much of the work is conducted in direct cooperation with the State agricultural experiment stations, other State and Federal agencies, and private organizations.

Central offices for the Deputy Director of AR and his staff, which are in the Washington, D. C. Metropolitan Area, provide overall leadership and direction to the programs and activities assigned to Agricultural Research. The field activities are managed on a geographical basis through four Regional Offices, 16 Area Offices, and seven major Research Centers. Research activities are carried out at 148 separate field locations. (As of September 30, 1980, the actual employment was 7,625 PFT employees and 1,479 other than permanent employees.)

SCIENCE AND EDUCATION ADMINISTRATION

The estimates include proposed changes in the language of this item as follows (new language underscored; deleted matter enclosed in brackets).

Agricultural Research

For necessary expenses to enable Agricultural Research to perform agricultural research and demonstration relating to production, utilization, marketing, and distribution (not otherwise provided for), home economics or nutrition and consumer use, and for acquisition of lands by donation, exchange, or purchase at a nominal cost not to exceed \$100 [~~\$414,367,000~~] \$456,881,000: Provided, That appropriations hereunder shall be available for field employment pursuant to the second sentence of section 706(a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed \$115,000 shall be available for employment under 5 U.S.C. 3109:

- 1 Provided further, That funds appropriated herein can be used to provide financial assistance to the organizers of international conferences, if such conferences are in support of agency programs: Provided further, That appropriations hereunder shall be available for the operation and maintenance of aircraft and the purchase of not to exceed one for replacement only: Provided further, That of the appropriations hereunder, not less than \$10,526,600 shall be available to conduct marketing research: Provided further, That appropriations hereunder shall be available pursuant to 7 U.S.C. 2250 for the construction, alteration, and repair of buildings and improvements, but, unless otherwise provided, the cost of constructing any one building shall not exceed [~~\$88,000~~] \$100,000, except for head-houses connecting greenhouses which shall each be limited to \$500,000, and except for ten buildings to be constructed or improved at a cost not to exceed [~~\$165,000~~] \$194,000 each, and the cost of altering any one building during the fiscal year shall not exceed 10 per centum of the current replacement value of the building or [~~\$88,000~~] \$100,000, whichever is greater: [Provided further, That the limitations on construction contained in this Act shall not apply to the establishment of a fruit and nut germ plasm repository at Davis, California, the establishment of a photo-period house at Canal Point, Florida, and construction of facilities at Plum Island, New York; Beckley, West Virginia; and Stillwater, Oklahoma:] Provided further, That the limitations on alterations contained in this Act shall not apply to a total of \$100,000 for facilities at Beltsville, Maryland: Provided further, That the foregoing limitations shall not apply to replacement of buildings needed to carry out the Act of April 24, 1948 (21 U.S.C. 113a). [Provided further, that \$12,100,000 of the appropriation provided herein for construction of facilities shall remain available until expended.]
 - 2
 - 3
 - 4
 - 5
 - 6
- [Special fund: To provide for additional labor, subprofessional, and junior scientific help to be employed under contracts and cooperative agreements to strengthen the work at Federal research installations in the field, \$2,000,000.]

The first change would provide financial assistance to the organizers of international conferences that are in support of agency programs. The historical use of SEA appropriations for this purpose, and the importance which the agency places on continued support for such meetings as a necessary means to accomplish its programs is emphasized.

The second change would increase the cost limitation of (1) constructing any one building (except headhouses connecting greenhouses) from \$88,000 to \$100,000; (2) increase the cost of building ten buildings from \$165,000 to \$194,000 each; and (3) altering any one building during the Fiscal Year from \$88,000 to \$100,000.

The construction cost limitation on buildings should be increased in Fiscal Year 1982 to maintain the previous values of these authorizations. The escalation from October 1980 to October 1981 was approximately 10 percent.

The third change proposes deletion of language which authorized the Department to establish a fruit and nut germ plasm repository at Davis, California. The repository will be completed in FY 1981 and similar language will not be required in FY 1982.

- The fourth change proposes deletion of language which authorized the Department to establish a photo-period house at Canal Point, Florida, and construction of facilities at Plum Island, New York; Beckley, West Virginia; and Stillwater, Oklahoma. Construction will commence in FY 1981 and similar language will not be required in FY 1982.

The fifth change proposes deletion of language pertaining to the specific funding level for the establishment of facilities including Plum Island, New York; Beckley, West Virginia; and Stillwater, Oklahoma. Construction will commence in FY 1981 and similar language will not be required in FY 1982.

The sixth change proposes deletion of language pertaining to the use of Special Funds. These funds will be merged with the regular Agricultural Research appropriation and specific language will not be required in FY 1982.

Agricultural Research

Appropriation Act, 1981.....	\$416,367,000
Budget Estimate, 1982.....	458,781,000
Increase in appropriation.....	<u>+ 42,414,000</u>

Adjustment in 1981:

Appropriation Act, 1981.....	\$416,367,000
1981 Supplemental Appropriations for Pay Costs.....	<u>+16,182,000</u>
Adjusted base for 1982.....	\$432,549,000
Budget Estimate, 1982.....	458,781,000
Increase over adjusted 1981.....	<u>+ 26,232,000</u>

SUMMARY OF INCREASES AND DECREASES
(on basis of adjusted appropriation)

<u>Item of Change</u>	<u>1981 Estimated</u>	<u>Program Changes</u>	<u>1982 Estimated</u>
Expanded basic agricultural research....	\$191,843,000	\$+5,500,000	\$197,343,000
Integrated pest management and biocontrol of pests.....	7,999,000	+ 500,000	8,499,000
Support of action agency requirements...	39,124,000	+6,490,000	45,614,000
Germplasm resources.....	10,309,000	+ 600,000	10,909,000
Pesticide Impact Assessment.....	675,000	+ 400,000	1,075,000
Research on minor use pesticides.....	868,000	+ 200,000	1,068,000
Tropical and Subtropical research.....	2,865,000	+1,160,000	4,025,000
Research on aerospace technology.....	5,005,000	+1,500,000	6,505,000
Land and water research in support of the Resource Conservation Act.....	3,190,000	+2,600,000	5,790,000
Research on acid precipitation.....	--	+ 150,000	150,000
Non-point source pollution research.....	8,301,000	+1,250,000	9,551,000
Energy retrofit of facilities.....	2,500,000	+1,000,000	3,500,000
Construction of European biocontrol facility.....	--	+1,900,000	1,900,000
Soil and water conservation research in Alaska.....	138,000	+ 300,000	438,000
Human nutrition research.....	31,595,000	+1,500,000	33,095,000
National Arboretum security.....	162,000	+ 400,000	562,000
Animal protection research.....	23,096,000	+1,150,000	24,246,000

<u>Item of Change</u>	<u>1981 Estimated</u>	<u>Program Changes</u>	<u>1982 Estimated</u>
Tobacco research.....	\$5,190,000	-\$1,048,000	\$4,142,000
Research on stored tobacco insects.....	182,000	- 182,000	--
Contagious equine metritis.....	100,000	- 100,000	--
Industrial uses of farm products.....	6,993,000	-1,779,000	5,214,000
Wool and mohair.....	1,599,000	-1,075,000	524,000
Research on Mt. St. Helens' eruptions....	1,000,000	-1,000,000	--
Nonrecurring construction items.....	12,100,000	-12,100,000	--
All other.....	<u>77,715,000</u>	<u>+16,916,000</u> a/	<u>94,631,000</u>
Total Available.....	<u>\$432,549,000</u>	<u>\$+26,232,000</u> b/	<u>\$458,781,000</u>

a/ Includes a total increase of \$13,199,000 toward increased operating costs in order to sustain performance levels for continuing programs. Includes a total increase of \$3,717,000 for annualized and absorbed pay increases effective in FY 1981 but which are necessary to carry out the programs proposed for FY 1982.

b/ The budget provides an overall increase of 8.7% for ongoing research programs. Within this amount, basic research will have real growth of 4.7%. The Administration's December 1980 economic assumptions estimate the rate of inflation for non-salary costs in FY 1982 at 9.7%. The budget requests for increased operating costs and restoration of prior years absorbed pay would provide sufficient funds to meet this rate of inflation.

Project Statement
(On basis of adjusted appropriation)

Project	1980		1981 (estimated):			1982 (estimated)	
	Amount	Staff Years	Amount	Staff Years	Increase or Decrease	Amount	Staff Years
1. Research on animal production:							
(a) Animal production efficiency re-search.....	\$68,704,813	1778	\$77,037,000	1797	\$ +7,613,000	\$ 84,650,000	1797
(b) Research on housing.....	401,110	8	436,000	8	20,000	456,000	8
Total, Research on animal production....	69,105,923	1786	77,473,000	1805	+7,633,000(1)	85,106,000	1805
2. Research on plant production:							
(a) Plant production efficiency re-search.....	136,853,137	3446	157,146,700	3529	+11,723,000	168,869,700	3529
(b) Tropical/Sub-tropical agricultural Research	2,270,557	5	2,865,000	5	+1,160,000	4,025,000	5
Total, Research on plant production....	139,123,694	3451	160,011,700	3534	+12,883,000(2)	172,894,700	3534
3. Research on the use and improvement of soil, water and air:							
(a) Research on conservation and use of land and water resources and maintaining environmental quality.....	33,994,884	822	40,687,200	853	+5,168,000	45,855,200	853
(b) Research on watershed development.....	12,453,005	313	13,855,200	320	+2,633,000	16,488,200	320
Total, Research on the use and improvement of soil, water and air.....	46,447,889	1135	54,542,400	1173	+7,801,000(3)	62,343,400	1173
4. Processing, storage distribution, food safety & consumer services research:							
(a) Processing, storage and distribution efficiency re-search.....	52,591,826	1451	58,600,100	1481	-334,000	58,266,100	1481
(b) Research to expand agricultural exports	2,475,291	56	2,255,500	60	+80,000	2,335,500	60
(c) Research to improve human health and safety.....	19,033,790	478	23,574,400	548	+4,691,000	28,265,400	548
(d) Research on consumer services...	620,150	19	680,900	22	+28,000	708,900	22
Total, Processing, storage and distribution, food safety, and consumer services research.....	74,721,057	2004	85,110,900	2111	+4,465,000(4)	89,575,900	2111
5. Research on human nutrition.....	27,468,167	348	31,595,000	358	+2,650,000(5)	34,245,000	358
6. Repair and maintenance of facilities and energy retrofit	5,100,000	--	10,716,000	--	+1,000,000(6)	11,716,000	--

Project	1980		1981 (estimated)			1982 (estimated)			
	Amount	Years	Staff	Amount	Years	Increase or Decrease	Amount	Years	Staff
7. Construction of facilities.....	3,900,000	--	12,100,000	--		-10,200,000(7)	1,900,000	--	
8. Contingency Research:									
Fund.....	1,000,000	--	1,000,000	--		--	1,000,000	--	
Unobligated balance	5,729,270	--	--	--		--	--	--	
Subtotal	372,596,000	8724	432,549,000	8981		+26,232,000	458,781,000	8981	
Deduct reappropriation.....	-2,000,000	--	--	--		--	--	--	
Total available or estimate.....	370,596,000	8724	432,549,000	8981		+26,232,000	458,781,000	8981	
Transfer in Estimate:									
To OICD.....	+995,000	--	--	--		--	--	--	
Rescission for furniture procurement.....	+1,732,000	--	--	--		--	--	--	
Supplemental for pay costs.....	- -	--	-16,182,000	--		--	--	--	
TOTAL, APPROPRIATION	373,323,000	8724	416,367,000	8981					

AGRICULTURAL RESEARCH

Explanation of Program

Under the Agriculture, Rural Development and Related Agencies Appropriation Act of 1980, Agricultural Research carries out the following activities:

1. Research on animal production. -- Research is conducted to improve livestock (including poultry) productivity and to improve the quality of meat and livestock products through improved breeding, feeding, and management practices. Research is conducted to develop methods for controlling diseases, parasites, and insect pests affecting livestock. Research is also conducted on ways to reduce rural housing construction and operating costs and on ways to control insects affecting man.
2. Research on plant production. -- Research is conducted to improve plant productivity through improved varieties of food, feed, fiber, and other plants; develop new crop resources; and improve crop production practices, including methods to control plant diseases, nematodes, insects, and weeds.
3. Research on the use and improvement of soil, air, and water. -- Research is conducted to improve the management of natural resources, including investigations to improve soil and water management, irrigation and conservation practices; to protect natural resources from harmful effects of soil, water, and air pollutants, and to minimize certain agricultural pollution problems; and to determine the relation of soil and water to plant growth, including impact on animal and human nutrition. The research includes studies on hydrologic problems of agricultural watersheds, and the application of remote sensing techniques in solving agricultural problems.
4. Processing, storage and distribution, food safety and consumer services research. -- Research is conducted to provide a basic reservoir of knowledge which will stimulate technological development and innovation in the processing, storage, and distribution of food and feeds and thereby improve productivity and reduce costs to the consumer. The research additionally provides support to the regulatory agencies in assuring the quality, safety, and nutrition of food and fiber, and in grading to facilitate movement in commerce and export. Research is conducted to reduce losses in post harvest handling of agricultural commodities including control of insects in storage and quality in export. Research is conducted on utilization of commodities, by-products, wastes and agricultural biomass as chemicals, alternative fuels and other critical materials.
5. Human nutrition research. -- Research is conducted on human nutritional requirements and the composition and nutritive value of food as needed by consumers, and by Federal, State, and local agencies administering food and nutrition programs.

The research performed by Agricultural Research is authorized by the Department of Agriculture Organic Act of 1862 (5 U.S.C. 511) and the Research and Marketing Act of 1946, as amended (7 U.S.C. 427, 427i).

JUSTIFICATION OF INCREASES AND DECREASES

(1) A net increase of \$7,633,000 for research on animal production efficiency consisting of:

- (a) An increase of \$769,000 for 1981 pay increases:
- (b) An increase of \$1,350,000 in basic animal research (\$40,845,000 available in FY 1981).

Need for Change: Animal products contribute more than half of the total nutrients of the average human diet in the United States. Present trends indicate that the demand for meat products will increase more rapidly than the demand for grains. Because of the continued competition for renewable resources such as grain for feed, lumber for housing, and energy for heating, animal production methods must change to meet changing resources and demands. Important breakthroughs in research are necessary to continue these advances to meet future needs for animal proteins. These breakthroughs are highly dependent on fundamental knowledge of stress, immunology, diseases, reproduction, and growth.

Nature of Change: The basic research program includes \$0.35 million to initiate and reinforce basic animal protection research programs at USDA laboratories. This includes basic research on the effects of environmental stress and nutritional stress on the immune system as related to disease research. New immunological techniques will be adapted to study the immune response to pathogens and to develop improved methods to diagnose disease agents.

The basic research program also includes \$1.0 million for basic animal production research. The research will provide fundamental knowledge on physiological and biochemical factors regulating utilization of forage nutrients by dairy cattle; explore basic structural and biochemical characteristics of a variety of residue and byproduct feeds and determine their metabolism in animals; and integrate basic aspects of growth engineering and production practices to optimize carcass characteristics of red meat species to best meet nutritional needs and desires of consumers.

(c) An increase of \$2,000,000 for research in support of FDA/FSQS/APHIS (\$15,163,000 available in FY 1981).

Need for Change: Food derived from animals will need to be even more safe and nutritious than it is at present. Solving animal product food safety problems has a direct impact on over 50 percent of the human food supply. The lack of sufficient attention to these broad problems will limit the availability of animal products for consumers in the future. Because of many emerging safety problems associated with eating foods that may contain hazardous chemicals, either man-made or of natural origin, there is a need for new research to support ongoing action and regulatory agency programs. Potential problems for man from chemicals and biological agents in food may cause an early onset of toxic symptoms or lead to long-term adverse effects. Also, there is a need to identify the effects of drugs, chemicals, and biological agents on the animal itself. Two specific areas require attention: (1) The toxicology and metabolism of drugs, pesticides, feed additives, hormones, and antibiotics in animals and the elimination of these chemicals to insure high-quality, residue-free

animal products; and (2) the need to increase our knowledge of foreign animal diseases, bluetongue, screwworms, scabies, and ticks in order to reduce their threat to the livestock industry in the United States.

Nature of Change: The research increase is specifically aimed at supporting critical research needs identified by APHIS, FSQS, and FDA. The research on toxicology and metabolism of chemicals, feed additives, hormones, and antibiotics will be devoted to developing effective methods to predict potential toxicological problems to animals and to evaluate the safety of animal products for humans; to develop detailed research programs on the metabolism and the elimination of pesticides, chemicals, and feed additives fed to animals to improve the efficiency of production; and to develop methods for early identification of natural, primarily plant, toxicants that may be hazardous to animals and to the food products derived from these animals.

Animal disease research in support of action and regulatory agencies will be initiated to solve problems on the control or eradication of bluetongue, African swine fever, screwworms, cattle ticks, and scabies; and toxicology of agricultural chemicals.

- (d) An increase of \$1,150,000 for research in animal protection (\$23,096,000 available in FY 1981).

Need for Change: Research is needed to develop improved methods of disease, parasite, and insect control in livestock and poultry. Currently, it is estimated that 15 to 20 percent of food animal's die before reaching market. These losses, plus the growth inefficiencies and treatment costs in animals that recover from illness, cost the consumer an estimated \$12 billion annually. In the nation's long-term outlook, these losses and inefficiencies will have even greater critical importance in terms of wasted energy and food resources and in limiting the capacity to meet the requirements of expanding national and international populations for high quality protein.

The Animal Health Science Research Advisory Board expressed strong concerns for more intensive research to solve animal health problems. This interest is understandable in view of the direct savings that could result from such research. The following are some examples.

Respiratory disease of cattle causes an annual loss exceeding \$225 million. There is strong expectation that the research proposed in this increment will lead to highly effective vaccines which could eventually reduce losses by 50 percent, an annual savings of \$12 million. New knowledge leading to enhancement of immunity mechanisms is expected to aid in controlling diarrhea of young animals. This control could reduce by 25 percent the annual losses of 0.5 million calves and 8 million pigs that die of intestinal disease. Savings would exceed \$100 million annually.

Nature of Change: The research will primarily be done at universities through cooperative agreements employing recent technological advances such as genetic engineering, cell-mediated immunity, monoclonal antibodies, and subunit vaccines. It will include the development of improved methods to control respiratory and enteric diseases of cattle and swine, to control fever tick, scabies, and stable flies, to control or eradicate slow viruses such as scrapie and chronic

progressive pneumonia in sheep, to control respiratory diseases of poultry, and to distinguish between the American and African forms of malignant catarrhal fever of cattle.

- (e) An increase of \$2,564,000 to provide for increased operating costs in animal production efficiency research.

Need for Change: Additional funding is essential to maintain the current level of program effort in animal productivity and animal protection research and to improve the efficiency of producing high quality animals and animal products. Costs of fuel, supplies, equipment, utilities, and other items used by researchers have risen sharply in recent years. The additional funds requested will provide some relief in meeting these increased costs and ensure that high priority research programs are not seriously disrupted.

Nature of Change: This increase will undergird facilities and staff operations. It will support ongoing programs and allow managers the flexibility to address crucial priority issues and respond to unanticipated problems of national importance.

- (f) A decrease of \$100,000 for contagious equine metritis research (\$100,000 available in FY 1981).

Need for Change: Reductions proposed in FY 1982 reflect the Department's policy to fund only research projects now considered as most essential to the Nation's agricultural and consumer needs. Achievement of this policy has been a major concern of the USDA in past years and has become even more critical in the preparation of the 1982 Budget given the overriding need to provide increases in other higher priority areas while holding overall spending to a minimum level.

Nature of Change: Currently the disease is confined to the States of Kentucky and Missouri and the extent of danger appears to be decreasing. The disease is presently being contained. Studies currently underway in Kentucky and Iowa and those planned within the current budget will provide sufficient knowledge of potential threat to the equine industry of the United States.

- (g) A decrease of \$100,000 for research on the impacts of the Mount St. Helens' eruptions (\$100,000 available in FY 1981).

Need for Change: The 1981 Appropriations Act provided additional funds for research on the impacts of the Mount St. Helens' eruptions. These emergency funds are being utilized in FY 1981 for research on various aspects of volcanic ash and its effect on agriculture in the impacted area. Ongoing research programs related to this mission will be available to carry out the important aspects of this work in FY 1982 and the Department recommends a reduction of the additional funds provided in FY 1981, \$100,000.

Nature of Change: Research on the most important facets of the impact of volcanic eruptions on animal production will continue under related ongoing research programs in FY 1982.

- (2) A net increase of \$12,883,000 for research on plant production efficiency consisting of:

- (a) An increase of \$1,427,000 for FY 1981 pay increases:
- (b) An increase of \$3,150,000 for basic research on crops (\$71,173,000 available in FY 1981).

Need for Change: Statistics continue to show increases in total crop productivity, but maximum yield levels are not increasing and our annual rate of increase of agricultural productivity appears to have declined recently. The increases are mainly due to improvement by below-maximum producers. Basic research is vital if yields are to be further increased and crop production is to respond to new demands for reducing inflation, improving human nutrition, expanding agricultural exports, reducing dependence upon nonrenewable energy sources, and minimizing adverse impacts of pests and environmental stresses.

The major strength of agricultural research lies in its capability to utilize fundamental knowledge from the basic sciences in the development of technologies, products, methodologies, and processes used by the vast system of food and fiber supply called "American agriculture." Agricultural research has been highly successful in this critical function, but its capability to translate scientific knowledge into agricultural technology for use in the field is directly related to the amounts and kinds of basic knowledge from which it can draw its applied and developmental research efforts. At present, the pool of basic scientific knowledge is being depleted rapidly. Our Nation must invest in basic biological science as we invested in physical science during the post-Sputnik period. In its broadest aspects, this increase would include fundamental research on plant science, biochemical and biophysical mechanisms, biochemistry and regulation of plant growth responses, gene manipulation (genetic engineering), and integrated pest management.

Nature of Change: The following lines of work will be initiated or strengthened:

- (1) Plant metabolism and biophysical mechanisms. Physical and metabolic responses to environmental stress (water, mineral and thermal; membrane research related to water and nutrient transport, energy conversion, bioregulation and translocation; and heritable linkage of the above characteristics in agronomic crop germplasm).
- (2) Factors affecting metabolism, reproduction, nutrient availability, membrane transport, and stress (environmental and biological).
- (3) Gene transfer through the use of recombinant (engineered) DNA molecules to alter the value of crops and to improve their utilization as food, feed, fuel, and chemical feedstocks. The objective is to develop methodologies to control gene transfer and gene expression in organisms of agricultural importance.
- (4) Impacts of biological agents that are introduced as pest controls into agricultural production systems. Mechanisms of host resistance/tolerance to pests; ecological relationships affecting host/pest/biological agent population dynamics, survival, species balance and diversity; and bioregulation of host-pest interactions in achieving pest control.

SEA maintains a critical mass of scientific experts, equipment and facilities for conducting fundamental research studies on all aspects of plant growth and protection. This increase will provide new expertise and techniques to strengthen and enhance the productivity of the existing research teams throughout basic, applied, and developmental research activities and provides new leads to future pest control technologies.

- (c) An increase of \$600,000 for research on germplasm (\$10,309,000 available in FY 1981).

Need for Change: Plant germplasm is the base for all applied breeding programs which develop new varieties and hybrids. Germplasm variability is imperative if breeders are to develop new, unique, productive plants for insuring a stable, plentiful, future supply of high quality food, feed and fiber. Two aspects of germplasm collection are critical. First, germplasm must be adequately collected and preserved in specialized storage facilities to guard against loss or damage. Second, the germplasm must be managed so that the entries are described accurately and completely, and are evaluated, replenished and distributed to users in a timely manner. The influx of material has far exceeded the capabilities of the National Plant Germplasm System to effectively discharge these essential functions. Concurrently, time is running out on our ability to prevent the rapid erosion and loss of natural genetic diversity through loss of wild habitat, pollution, and replacement of local varieties and land races by new, high yielding varieties most frequently grown in monoculture. Extinction of species is currently on a scale without precedence. Once lost, natural genetic diversity can never be retrieved. This increase in funding will provide impetus to the high priority effort of preserving and fully utilizing our germplasm heritage.

Nature of Change: Increased funding will be used to provide new support to critical elements of the National Plant Germplasm System, which is under the guidance and review of the National Plant Genetic Resources Board established by the Secretary of Agriculture. The Board fully represents the Federal, State, and industry sectors of American agriculture. All germplasm programs involve joint planning, responsibility, and decision-making to assure that valuable seed and clonal materials are fully protected and utilized. Specific use of the funds will be to improve the USDA World Small Grain Collection, support the International Performance Nursery for Wheat Improvement, and to strengthen the Regional Plant Introduction Stations through general upgrading and maintenance, and for increased germplasm evaluation. Additional funds are being allocated to the State agricultural experiment stations through SEA-CR Special Grants for maintenance of special genetic and cytogenetic stocks.

- (d) An increase of \$1,160,000 for tropical and subtropical agricultural research. (\$2,865,000 available in FY 1981).

Need for Change: Research in this program supplies the link between basic research conducted in the U.S. primarily for Temperate Zone agriculture, and the technical needs of those producers located in subtropical and tropical regions controlled by U.S. and developing countries. The 1980 USDA Users Advisory Board recommended that SEA and its cooperators participate more actively in agricultural technical assistance for increasing food production and availability to hungry developing nations. This program, authorized by Sec. 406 of the 1966 Foreign Assistance Act, has, since its inception, been the USDA's only independent legal authority for this type of work. The objectives of this program are to develop appropriate crop production systems with pest and stress resistant varieties; pest management systems, cultural practices, rotations, mixed and multiple cropping; and new technology for handling soil and water resource problems to increase efficiency of agricultural production in tropical and subtropical areas of the world to help meet current and future food, feed, and fiber needs.

The program is managed by SEA-AR in cooperation with participating land-grant universities involving two regional advisory groups (the Pacific Basin Advisory Group and the Caribbean Basin Advisory Group) and a National Advisory Group, that are composed of officials from USDA and U.S. universities. These groups plan and coordinate the program and

oversee the review of projects and selection of project proposals. Florida, Hawaii, Puerto Rico, and the Virgin Islands are currently the primary State agricultural experiment station participants. Additional research is needed to support and complement agricultural and food programs in view of recent legislation extending several Federal programs to American Samoa, Micronesia, and Commonwealth of the Northern Marianas.

Nature of Change: Increased funding is for the development of germplasm and varieties of tropical and subtropical commodities resistant to diseases, insects, and environmental stresses; integrated pest management systems adapted to tropical and subtropical conditions; and commodity treatments to allow shipment of fresh fruits and vegetables. A substantial portion of this request will be used to support and strengthen existing programs at the Mayaguez Institute of Tropical Agriculture, Mayaguez, Puerto Rico, and elsewhere in the Caribbean Basin, and to initiate production research to meet the specific needs of American Samoa, Micronesia, Guam, and the Northern Marianas to develop expanded food production as quickly as possible at these locations. This increase will permit new initiatives in the Pacific Basin.

- (e) An increase of \$500,000 in biological control research for Integrated Pest Management (IPM) of diseases, insects, nematodes, and weeds (\$7,999,000 available in FY 1981).

Need for Change: Biological control is often the most environmentally acceptable and economically feasible means of dealing with serious pest problems. Biological control has the potential to be the cornerstone of many IPM systems. There are about 30 examples in the United States in which biological control has solved insect and weed problems without the need for any supplemental control with pesticides or other methods. There are severalfold more examples of insect problems having been significantly ameliorated by the introduction of beneficial insects from aboard.

Nevertheless, very little systems research has been conducted to incorporate biological control agents into IPM systems. For example, there is not one documented example of the use of biological control as a component in an integrated nematode management system; and only one documented example of the use of biological control in an integrated weed management system. Similarly, there is only one documented case of the joint use of biological agents and resistant cultivars to manage a plant disease.

Nature of Change: In order to assure the incorporation of biocontrol agents into the four regional IPM systems for major commodities, research will be conducted to accomplish the following objectives:

- Develop the use of natural enemies of soilborne diseases of wheat for use in IPM systems.
- Develop the use of insect pathogens as components of IPM systems for rangeland and cropland grasshoppers.
- Develop the use of biocontrol agents as components of IPM systems for rangeland weeds.
- Develop the use of biocontrol agents as components in IPM systems for insecticide-resistant Colorado potato beetles.

- (f) An increase of \$400,000 for Pesticide Impact Assessment (PIA) (\$675,000 available in 1981).

Need for Change: Under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) pesticides must be periodically evaluated for human health and environmental effects. This is accomplished through a formal procedure known as RPRA (Rebuttable Presumption Against Registration).

Pesticides have a key role to play in protecting our essential agricultural and forestry production. Objective pesticide registration and reregistration decisions must be based on accurate analyses of the benefit and risk consequences of pesticide use to man and the environment. These are necessary if we are to continue to have effective pesticides available to ensure adequate levels of agricultural and forestry production.

Data must, however, first be available before accurate and objective decisions can be made. The regulatory options proposed by EPA for RPAR'd compounds have focused primarily on the calculated level of exposure of applicators, mixers/loaders, field workers, or the general public. Thus, the lack of empirical information on exposure has been critical in the case of all pesticides RPAR'd to date. Other important data gaps relate to benefits (quality and yield data, use and economic information); environmental risk (aquatic and wildlife impacts, fate and runoff); and residues (soil and crop).

Since the start of the program, USDA and its cooperators have established assessment teams for 26 pesticides identified for the RPAR process and for 5 pesticides for which RPAR's have not yet been issued. These 31 teams have involved the participation of some 300 scientists from Federal agencies, State Experiment Stations, State Extension Services, State Departments of Agriculture, and others. Currently, 20 reports have been completed and 11 assessments are in process. These studies have shown that the potential short-term adverse economic impact of the cancellation of the first 20 pesticides is over \$1 billion per year. Also, State and Federal research scientists have conducted over 300 laboratory experiments, field trials, and other studies to obtain information relating to efficacy, crop yields and quality, exposure, environmental concerns and pesticide use.

Nature of Change: Funds will be used for the following purposes:

- Initiate up to 20 short- and long-term research studies each year to provide experimental data on exposure of people to pesticides and on environmental effects.
 - Form 8 to 10 teams to obtain pesticide use information on: crop yield and quality information, pesticide exposure information under field use conditions for applicators, mixers/loaders and bystanders, and wild life and environmental effects.
 - Assess potential effects of regulatory decisions by commodity.
- (g) An increase of \$1,200,000 for research in support of the APHIS plant pest control programs (\$11,894,000 available in FY 1981).

Need for Change: APHIS is charged with preventing the entry and spread of dangerous pests (insects, nematodes, plant pathogens and weeds) in the U.S. The Plant Protection and Quarantine programs of APHIS include international and emergency efforts to maintain the Nation's first line of defense against foreign pests. For example, APHIS is currently involved in an extensive effort to stop the northward movement of the Mediterranean fruit fly in Mexico.

APHIS needs the capability to rapidly and reliably identify pests, to eliminate pests which hitchhike on aircraft, ships, trucks, etc., to destroy pests within commodities by means of safe fumigation or other procedures, and to be able to assess the potential for foreign pests to spread into various regions of the U.S. and to cause damage.

If the Mediterranean fruit fly or the poisonous weed, alfrombrilla, were to enter and reach their ecological limits in the U.S., serious damage would result. The fruit fly would cause an estimated million acres of citrus and other commodities to require area-wide insecticide treatment at least 10 times per year. An additional 10 million acre equivalent of backyard fruit trees would be infested and would require various levels of protection with insecticide. Alfrombrilla, a poisonous weed that kills cattle, would have to be controlled by herbicides on each acre infested to prevent further spread.

In order for the U.S. to maintain and expand its export markets, many commodities must be fumigated so that foreign countries can permit their entry without the risk of importing dangerous pests. Ethylene dibromide and to some extent methyl bromide have been used for this purpose. There is an urgent need to find alternative fumigants because the organic bromide residues in food are considered to pose a potential health hazard.

Freons which are used as propellants in aerosol cans are believed to threaten the stratospheric ozone layer which shields the earth from excessive ultraviolet radiation. Clearly, new safety propellants are needed. In addition new insecticides are needed which can be introduced into aircraft without risk to the passengers in order to kill hitch-hiking insect pests.

Of the several million species of insects and nematodes that exist, about one percent are significant pests. APHIS needs practical taxonomic aids for distinguishing the pests from the innocuous invertebrates.

Nature of Change: Additional funds will be used for the following purposes:

- Improve mass production and release of sexually sterile Mediterranean fruit flies, and improve technology for detecting and trapping this pest.
- Expand efforts to assist APHIS in identifying insects and nematodes.
- Determine the ecological areas of adaptations of alien noxious weeds in the United States, develop technology to reduce their chances of entry and spread, and develop control systems.
- Discover and develop quarantine treatments with alternative fumigants to replace the organic bromides, with emphasis on tropical fruit flies.
- Develop aircraft disinsectization techniques with alternative propellants to replace the freons and with new safer insecticides.

(h) An increase of \$200,000 for research to facilitate registration of pesticides for minor uses (\$868,000 available in FY 1981).

Need for Change: Recent amendments to the Federal Insecticide Fungicide and Rodenticide Act require periodic reregistration of pesticides for all uses. The data needed to establish that the benefits of minor uses exceed the risks frequently do not exist. Consequently, there are now more than 800 minor use needs for which registration data are required. In order to meet this need, USDA/SEA/AR laboratories work with State Agricultural Experiment Stations in Interregional Project No. 4 (IR-4).

Only modest progress has been made by industry in registering microbial agents, pheromones and other biorational pesticides. Much greater commitment by industry would likely occur if the public sector would supply a larger portion of the safety and environmental data needed for registration of biorational pesticides.

Nature of Change: The increase funds will be directed to the following objectives:

- Increase the capability to obtain the pesticide residue data needed to establish national tolerances on food crops.
- Obtain data on efficacy of pesticides and on their propensity to injure minor food crops and nursery and floral crops.
- Obtain data on safety and environmental effects of microbial agents and specialty chemicals.

(i) An increase of \$400,000 for improving security at the U. S. National Arboretum (\$162,000 available in FY 1981).

Need for Change: The existing facilities and manpower at the U.S. Arboretum in Washington, D. C., are inadequate to provide the necessary security that is essential to safeguard the visiting public and protect U. S. Government property and irreplaceable plant specimen possessions of the U. S. National Arboretum. There has been a significant increase in crimes against persons and property at this location which have resulted in substantial property losses and damage as well as major assaults and injuries to the visiting public.

Nature of Change: The increase of \$400 thousand will provide for vital security both in terms of physical improvements at the U.S. National Arboretum and development and strengthening of the security staff. It will also provide for the renovation of a 30 year old perimeter fencing system for additional security and safety of visitors and plant specimens.

(j) An increase of \$5,394,000 to provide for increased operating costs in plant production efficiency research.

Need for Change: Additional funding is essential to maintain the current level of program effort in crop productivity and crop protection research to improve the quality and production efficiency of food, feed, forage and fiber crops; florist and nursery crops; rangelands and turfs. Costs of fuel, supplies, equipment, utilities and other items used by researchers have risen sharply in recent years. The additional funds requested will provide some relief in meeting these increased costs and ensure that high priority research programs are not seriously disrupted.

Nature of Change: This increase will undergird facilities and staff operations. It will support ongoing programs and allow managers the flexibility to address crucial priority issues and respond to unanticipated problems of national importance.

(k) A decrease of \$1,048,000 to eliminate production-related tobacco research (\$5,190,000 available in FY 1981).

Need for Change: This proposed decrease reflects the Department's policy to concentrate efforts on the health and safety aspects of tobacco research rather than production oriented aspects of tobacco research. It is felt that greater benefit to the health and safety of our Nation's population can be derived by concentrating Federal research efforts on health and safety aspects of tobacco.

Nature of Change: Tobacco health and safety research will continue at the FY 1981 level. Tobacco production research on the control of tobacco growth, culture, breeding, and quality of flue-cured tobacco, burley tobacco, and insect growth will be discontinued in FY 1982.

- (1) A decrease of \$500,000 for research on the impacts of the Mount St. Helens' eruptions (\$500,000 available in 1981).

Need for Change: The 1981 Appropriations Act provided additional funds for research on the impacts of the Mount St. Helens' eruptions. These emergency funds are being utilized in FY 1981 for research on various aspects of volcanic ash and its effect on agriculture in the impacted area. Ongoing research programs related to this mission will be available to carry out the important aspects of this work in FY 1982 and the Department recommends a reduction of the additional funds provided in FY 1981, \$500,000.

Nature of Change: Research on the most important facets of the impact of volcanic eruptions on crop production will continue under related ongoing research programs in FY 1982.

(3) A net increase of \$7,801,000 for research on conservation of land, water, and air resources and watershed development consisting of:

- (a) An increase of \$501,000 for 1981 pay increases.
- (b) An increase of \$200,000 for basic research on the use of land, water, and air resources (\$21,539,000 available for FY 1981).

Need for Change: There is increasing evidence that much of our current U.S. agricultural productivity, based on discoveries made in the past few decades, has peaked. The expanding population is competing with agriculture for prime land. Limitation on prime land necessitates the increased use of land less suitable for agricultural production and more susceptible to drought and erosion. Systems must be developed that will permit utilizing these lands while preserving environmental quality as mandated under RCA and RCWP programs. To increase production potential in an environmentally acceptable manner, new breakthroughs in our understanding of the dynamics of soil-plant-air-water systems is essential. One major area of concern is the impact of environmental stress factors on crop yields. Developing technology to ameliorate these efforts could be a highly significant factor in increasing production and preserving environmental quality.

Nature of Change: This increased funding will strengthen the current basic research effort to provide a better understanding of the effect of environmental crop stress factors on plant growth and physiological processes such as tillering and the translocation of plant nutrients in the soil-plant system, and within plants. As mechanisms are elucidated, methods can be explored for ameliorating stress effects through modified cultural practices. The programs are closely coordinated with basic research efforts in crop production and plant physiology. Qualified scientists and unique facilities are available to provide a well-coordinated effort.

(c) An increase of \$1,500,000 for research on aerospace technology (AgRISTARS) (\$5,005,000 available in FY 1981).

Need for Change: Application of aerospace technology to meet agricultural needs has been given high priority by action agencies. SEA is in an excellent position to develop models of crop growth, crop yield, hydrology, sediment, pollution, and agroecosystems necessary for the efficient application of aerospace technology data. SEA scientists also have the expertise to study the soil-plant-atmosphere-light continuum that will provide the information needed in developing the next generation of remote sensors. A strong research program is essential if aerospace technology is to be profitably applied to agricultural systems. Additional research is needed on aerospace technology research on the soil-plant-atmosphere-light continuum to improve our understanding of agricultural systems, and to develop models of agroecosystems.

Nature of Change: In FY 1982, SEA will expand its research effort to (1) improve existing hydrologic, sediment, and nonpoint pollution models for assisting conservation and clean water programs (RCA & RCWP), (2) develop new techniques to detect, quantify and provide early detection of agroecosystem stress, (3) develop new and improve existing crop growth and yield models for use in production forecasting, (4) develop methods to inventory and assess conservation practices and pollution effects, and (5) develop methods to detect and monitor insect populations and movements.

- (d) An increase of \$2,600,000 for land and water conservation research in support of the Resource Conservation Act (RCA) (\$3,190,000 available in FY 1981).

Need for Change: Limited research has been devoted to the effects of erosion on productivity. A few plot and field experiments have demonstrated that erosion can drastically reduce crop yields but not nearly enough to provide the information needed to target soil conservation programs for various soils at different locations. New varieties and improved management have masked the effect of erosion on productivity. Erosion models have been developed for designing erosion control systems, predicting sediment yield for reservoir design, predicting sediment transport, and recently, water quality simulation. However, erosion models have not been linked with crop growth models to specifically study the relationship of erosion to productivity.

A prime objective of the RCA program is to reduce erosion to the T-value (tolerance level) or less on cropland, range, and non-Federal forestland and pastureland. This increased increment will materially assist the effectiveness of conservation strategies by: (1) quantifying the relationship between erosion and crop yields, (2) improving prediction equations for water erosion, and (3) helping to assess the economic benefits of conservation tillage systems and associated erosion control practices.

Nature of Change: The increased funding will be used to: (1) conduct nationwide field experiments to determine the effect of erosion on soil productivity, (2) develop models to predict the effect of erosion on soil productivity and the effect of management practices (tillage, fertility, erosion control, etc.) on crop yields and long-term soil productivity, (3) develop conservation tillage systems applicable to a wide range of crop residue and potential soil erodibility conditions, and (4) improve the accuracy and range of application of models for predicting water and wind erosion through the development of a sound theoretical understanding of the basic mechanics of erosion.

- (e) An increase of \$1,250,000 for research on methods for assessment and control of nonpoint source pollution from agriculture lands (\$8,301,000 available in FY 1981).

Need for Change: It is recognized that agricultural practices may have an adverse effect on downstream water quality. Being a nonpoint source, large scale monitoring is prohibitive and predictive mathematical models will have to be developed to estimate the impact of various land use practices on water quality. Corrective measures will involve developing, testing, and implementing best management practices economically compatible with difficult land use resource areas and changing farming systems. This research is necessary for the successful development and implementation of the RCWP and the RCA to develop the ability to identify key sources of nonpoint sources of pollution and to apply the best management practices economically feasible.

Nature of Change: This increase will be used to expand existing field scale models to watershed and basin scales. Increased basic research on the fate and transport of agricultural chemicals will provide data for developing a more reliable predictive capability for the movement of these materials on agricultural watersheds. Increased emphasis will also be placed on evaluating changes in water quality, including eroded sediments, that occur during both overland and channel flow. These efforts will be centrally coordinated and integrated. Additional research will be directed toward using this information in the development of new or improved structural and nonstructural management practices.

- (f) An increase of \$150,000 for research on acid precipitation (\$-0-
available in FY 1981).

Need for Change: The increase in acidity of rainfall during the past 10 years has been documented. This problem relates to energy utilization. High sulfur coal and other fossil fuels emit sulfur and nitrogen compounds when burned and pollute the air. Some data are available on the effect of acid rain on aquatic ecosystems. Although not yet documented, adverse impacts of acid rain on soil, water, food crops, and forests are suspected. Acid rain research was identified as a high priority in the President's Environmental Message for 1979 and in the Energy Security Act of 1980. As the Nation moves to a greater dependence on coal as an energy source, the acidity of precipitation is expected to increase still more. Sound decisions on regulatory controls for emissions and on agricultural approaches to ameliorate effects of acid rain will require a better understanding of the extent and nature of acid rain and its effect on biological systems. Action agencies are dependent upon research and technology transfer capabilities of this agency for guidance in implementing their programs.

Nature of Change: Major knowledge gaps exist in our understanding of the impact of acid rain on plants and soils. Relatively little research information is available on this subject. SEA-AR does not have an ongoing research program in this area, but it does have the facilities and scientific expertise to do this. The increased funding would be used to initiate a research effort to assess potential economic losses from the effects of acid rain on soils and plants and to achieve a better understanding of the basic processes involved.

- (g) An increase of \$300,000 for soil management research in Alaska
(\$138,000 available in FY 1981).

Need for Change: Alaska's ability to meet the challenges of expanded agricultural production in an environmentally and economically sound manner will depend to a large extent on how well the soil and water resources of the State are managed. Fertilizers and other agricultural chemicals must be brought from long distances; therefore, fertilizer use efficiency and the efficient recycling of nutrients from crop residues is important. Soil and water conservation management practices are needed for the large acreages of Alaskan soils that have been identified as suitable for agricultural use. Many of these soils formed from deposited sediments in major river valleys by water and wind. Consequently, water and wind erosion of these soils is a major concern as these lands are brought into cultivation. In addition, these soils are cold and growing seasons are short. Soil management practices developed for the soils elsewhere in the United States are not directly adaptable to the unique problems in Alaska.

Nature of Change: This increased funding will be used to: (1) develop conservation tillage or other residue management or soil and water conservation practices to protect soils being brought into production from water and wind erosion, (2) develop fertilizer and plant nutrient management systems that result in optimum fertilizer use efficiency, (3) develop soil and water management practices for the cold soil conditions in Alaska, that allow optimum production of crops and maintenance of soil fertility and tilth, without increasing potential soil erosion problems. Research contracts will be used as needed to provide specific research projects which will complement the Federal research efforts.

- (h) An increase of \$1,700,000 to provide for increased operating costs in research on conservation and use of soil, water, and air resources.

Need for Change: Additional funding is essential to maintain the current level of program effort in research to improve the cropland, watershed, rangeland and non-cultivated areas of the U.S. Costs of fuel, supplies, equipment, utilities and other items used by researchers have risen sharply in recent years. The additional funds requested will provide some relief in meeting these increased costs and ensure that high priority research programs are not seriously disrupted.

Nature of Change: This increase will undergird facilities and staff operations. It will support ongoing programs and allow managers the flexibility to address crucial priority issues and respond to unanticipated problems of national importance.

- (i) A decrease of \$400,000 for research on the impacts of the Mount St. Helens' eruptions (\$400,000 available in FY 1981).

Need for Change: The 1981 Appropriations Act provided additional funds for research on the impacts of the Mount St. Helens' eruptions. These emergency funds are being utilized in FY 1981 for research on various aspects of volcanic ash and its effect on agriculture in the impacted area. Ongoing research programs related to this mission will be available to carry out the important aspects of this work in FY 1982 and the Department recommends a reduction of the additional funds provided in FY 1981, \$400,000.

Nature of Change: Research on the most important facets of the impact of volcanic eruptions on soil and water resources will continue under related ongoing research programs in FY 1982.

- (4) A net increase of \$4,465,000 for research in processing, storage, distribution, food safety and consumer services research consisting of:
- (a) An increase of \$858,000 for FY 1981 pay increases.
 - (b) An increase of \$800,000 for basic research (\$39,700,000 available in 1981).

Need for Change: Monetary value, quality, nutrient content, and those factors which control our ability to store, preserve, and export foods and feeds are all dependent upon genetically determined characteristics. It is now within the realm of scientific capability to modify or control these characteristics by direct, purposeful intervention at the genetic material level and/or the regulatory (hormonal control) levels. It is particularly in the interest of the producer, consumer, and exporter to effectively and specifically control deterioration in harvest commodities by energy efficient procedures. To date postharvest quality retention has been accomplished empirically by use of physical measures that control metabolic activity. More precise, energy efficient approaches will require a definitive knowledge and understanding of hormonal regulation of membrane function. Knowledge of basic factors related to successful plant protoplast fusion (genetic engineering) is also essential to genetic modification for desired quality traits.

Aflatoxin is a highly carcinogenic product of the mold, Aspergillus flavus. Food and Drug Administration regulations require that commodities containing more than 20 parts per billion of aflatoxin cannot be used as food or feed. The significant A. flavus infestation and resultant aflatoxin contamination of corn and peanuts in the field and during storage in the 1980 crop year has further decreased the drought limited supplies of these food and feed commodities and produced economic stress for both farmer and consumer. Research has provided methods for detection and detoxification of aflatoxin and current efforts to establish the safety of the detoxification process should soon provide an interim solution to the problem. However, removal of aflatoxin from the food supply after harvest of the crop is not a satisfactory long-term solution because of the severe economic losses involved as well as the burdensome regulatory surveillance needed to prevent hazard to consumers. Methods must be developed to prevent or control aflatoxin production in the crop itself. Basic research is needed to provide an understanding of the relationship between plant stress factors and the mechanisms of A. flavus infestation during growth and maturation of crops.

Nature of Change: This research will strengthen and expand current program initiatives in the following areas:

- Specific sites and mechanisms of hormonal interactions.
- Hormonal action of peptides that regulate membrane transfer and enzymatic activity.
- Mechanisms of hormonal regulation of genome activity and the specific gene-enzyme systems involved in these events.

-- Factors regulating successful protoplast fusion in alcohol producing yeasts.

The basic research in this program will provide a more complete understanding of postharvest biological processes, lead to reduced energy consumption, and improve the quality of the commodity.

This increased funding will also expand and extend efforts to develop a long-term solution to the aflatoxin problem. The present nucleus of basic research on the mode of infestation will be expanded. Research efforts will be extended to determine the relationship between plant stress factors affecting metabolism and growth, and those factors relating to A. flavus infestation and aflatoxin production. With this knowledge, methods for control of infestation through genetic change, and changes in crop management systems can be developed. These studies would be conducted in close association with scientists engaged in developing improved crop and pest management systems and, in major part, at locations with recurring incidence of aflatoxin problems.

(c) An increase of \$3,290,000 for support of APHIS, FSQS, and FDA programs (\$12,067,000 available in 1981).

Need for Change. The plant protection and quarantine programs of APHIS are the first line of defense against entry and spread of foreign plant and animal diseases and pests. Treatments to destroy fruit flies in cargoes of fruits and vegetables moving in commerce from infested areas are a high priority part of these programs. Currently available fumigants for quarantine treatment are severely limited in their utility and are in question as to their complete safety. New treatment methods are needed to prevent severe problems in the future. Likewise the effectiveness of control over import of numerous exotic plant and animal diseases and pests is limited by manpower and facilities available to conduct inspections at ports of entry. Effective, efficient systems for detecting contraband are needed to provide an extra level of assurance not achievable by manual inspection methods and to avoid serious delays of passengers at ports of entry to this country.

Increasing concern about the safety and quality of the food supply has led to expanded research programs to determine and improve the nutritional quality of food. These research programs also seek to identify the role processing plays in food quality, and how naturally occurring and inadvertant residues of toxic chemicals, natural toxicants and food additives affect the safety of food. Action/regulatory agencies, which respond to health issues, generate increased needs for research. SEA is committed to responding to the research needs of action/regulatory agencies and is the principal research and education provider. FSQS and FDA, two agencies SEA supports through its research programs, have unique research needs to support regulatory changes in food monitoring, or establishment of new processing procedures for safer foods.

Nature of Change: Increased efforts will be directed toward developing quarantine treatment methods for effectively and efficiently destroying unwanted plant pests in fruit and vegetable cargoes, without impairing the safety or quality of the commodity. (\$410,000 will be committed to this effort.) Efforts, for which funding is currently being supplied by APHIS, would be continued on development of sensitive instrumentation to detect agricultural contraband in passenger's luggage entering the United States. (\$300,000 will be committed to this effort.)

Research will address FDA's highest priority request, basic research on the adherence of microorganisms to food surfaces. Research to find alternatives to nitrite presently used in cured meat and poultry products will focus on food irradiation and anti-botulism agents. Research will develop rapid techniques for nutrient analysis of foods that can be used by FSQS to verify label claims on Federally-inspected foods. Also, new rapid detection techniques are to be developed to monitor drug and toxic residue in animal tissues, including antibiotics, tranquilizers, other veterinary drugs, and aflatoxin. Basic studies on tissue denaturation by heat will attempt to provide FSQS with an improved method of determining the temperature to which meat and poultry has been cooked. Objective physical techniques for meat and animal evaluation will be studied to develop instrumentation that may be used in grading meat and detecting egg deterioration. Basic studies on nutrient interrelationships and the effect of drugs and pesticides on nutrient composition of animal tissue will be done to assist FSQS in its food inspection program.

- (d) An increase of \$2,553,000 to provide for increased operating costs in processing, storage, distribution, food safety and consumer services research.

Need for Change: Additional funding is essential to maintain the current level of program effort in Post Harvest Science and Technology research involving food quality and safety; technology and safety in non-food areas and the processing, distribution and export of agricultural products. Costs for fuel, supplies, equipment, utilities and other items have risen sharply in recent years. The additional funds requested will provide some relief in meeting these increased costs and ensure that high priority research programs are not seriously disrupted.

Nature of Change: This increase will undergird facilities and staff operations. It will support ongoing programs and allow managers the flexibility to address crucial priority issues and respond to unanticipated problems of national importance.

- (e) A decrease of \$3,036,000 from current funding for product development research projects that can be assumed by the industries primarily benefitting from such product development. (\$8,774,000 available in 1981).

Need for Change: The decreases proposed in FY 1982 reflect the Department's policy to emphasize and fund only high priority research projects essential to the Nation's agricultural and consumer needs and not likely to be otherwise funded. This has been a major concern of the USDA in past years and has become even more critical in the preparation of the 1982 Budget given the Federal Government's commitment and need to provide increases for higher priority research while holding overall spending to a minimum.

Nature of Change: The following are the specific decreases proposed:
Wool and mohair research - \$1,075,000. Consists of research to solve problems associated with the utilization of American wool by U.S. small woollen mills. The program is being reduced considering the ability of states or other cooperators to perform this activity.

Industrial use of animal fats - \$258,000. Consists of utilization research to develop new enzymatic methods for rendering animal fats and chemical modifications of animal derived fatty acids. The program is being reduced considering the ability of industry, or other cooperators to perform this activity.

Industrial uses of farm products - \$1,521,000. The proposed reduction will terminate Federal Research to increase the utilization of cereals and oilseeds through the development of agriculturally based industrial products. This recommendation is based on industry's capabilities to assume this research program.

Tobacco insect research - \$182,000. This program deals with the development of biological, physical and physiological mechanisms and chemical agents for control of tobacco insects. This work can be assumed by industry.

- (5) An increase of \$2,650,000 for human nutrition research consisting of:
- (a) An increase of \$162,000 for 1981 pay increases.
 - (b) An increase of \$300,000 to strengthen and implement research programs on nutrient composition of food (\$2,932,000 available in 1981).

Need for Change. Many laboratories supply data on nutrient composition of foods. This information is used to guide decisions by regulatory agencies as to the nutrients that should be identified in certain foods; consumers can then use the information in making food choices. This information is also used by dietitians and physicians who give advice about nutrition to patients who are ill, and by food intervention programs and action agencies for the development of sound food programs.

To be useful, the data must be reliable. Since a number of different methods are used in various laboratories, it is presently difficult to compile reliable data obtained from these laboratories. It is therefore necessary to establish well-characterized food samples which can be used as national standards for nutrient analyses in different laboratories. This will greatly enhance the reliability and usefulness of the nutrient analyses of food obtained from these laboratories.

Nature of Change. This work will be done in close coordination with related work done in other units of the USDA. Development of food standards will be in cooperation with the National Bureau of Standards and the Environmental Protection Agency. As the national food standards are developed they will become part of the national specimen bank, managed by the National Bureau of Standards. The Environmental Protection Agency will contribute to the support of the bank because of their interest in the effects of environmental factors in the food chain.

- (c) An increase of \$600,000 to strengthen an implemented highly targeted research in nutrient requirements and relationships to health (15,581,000 available in 1981).

Need for Change. The study of nutrient requirements in humans presents problems that are not encountered when animal models are used. It is usually not possible to use radioactive tracers to study specific nutrients when dealing with humans. Fortunately, methods are presently being developed that permit the use of stable (non-radioactive) isotopes in human studies. There is a need however to prepare foods enriched with stable isotopes for use in studies involving human subjects. The increased funds will provide a program for experts in human nutrition to interact with scientists who have the necessary background to develop foods enriched with stable isotopes. Improved knowledge of human nutrition needs would benefit large portions of the U.S. population. It would help action and regulatory programs in their efforts to improve the nutrition of their clientele.

Nature of Change. Research using stable isotopes for studies of nutrient requirements will supplement research carried out at the AR laboratory in Ithaca, New York. In addition, the targeted research on the relationships of nutrition to human health will be carried out through requests for proposals for research in certain aspects of nutrition and health.

- (d) An increase of \$600,000 for nutrition education research (\$900,000 available in 1981).

Need for Change. It is necessary to better understand the process of translating basic nutrition research findings into guidelines that can be put into practice by the public. Food selection is influenced by age, culture, sub-culture, lifestyle, availability, socio-economic status and education to name only a few factors. Nutrition education, to be effective, must take into account the factors that influence food selection and the environment in which the food is consumed.

Over the past two decades, the above factors have changed markedly. The nature of the food supply has also changed. Even the nutrition message is changing. Whereas 50 years ago large segments of the population were at risk for diseases caused by nutrient deficiencies, major concern today is for over-consumption and the interplay between life style, nutrition and degenerative diseases. Yet the premises on which current nutrition education is based are those of twenty years ago.

Nature of Change. Research to provide information necessary to sound programs in dietary guidance and human nutrition education will be coordinated, primarily through an extramural program of contracts and cooperative agreements, with State and private institutions, to utilize the best expertise available. Several outstanding researchers with expertise basic to this area have been called upon to give broad guidance to this research program. Research designed to provide information to improve techniques for transmitting clear and up to date nutrition knowledge to the American public will receive emphasis.

- (e) An increase of \$988,000 to provide for increased operating costs in human nutrition research.

Need for Change: Additional funding is essential to maintain the current level of program effort in research involving human nutrition. Costs of fuel, supplies, equipment, utilities and other items used by researchers have risen sharply in recent years. The additional funds requested will provide some relief in meeting these increased costs and ensure that high priority research programs are not seriously disrupted.

Nature of Change: This increase will undergird facilities and staff operations. It will support ongoing programs and allow managers the flexibility to address crucial priority issues and respond to unanticipated problems of national importance.

- (6) An increase of \$1,000,000 to Retrofit Existing Science and Education Administration Facilities with Cost-Effective Energy Conservation Measures (\$2,500,000 available in FY 1981).

Need for Change: In an effort towards compliance with the retrofit requirements of the National Energy Conservation Policy Act (P.L. 95-619), as well as the 20 percent reduction in energy consumption required by Executive Order 12003 by 1985, a preliminary 6-year Retrofit Program was established in FY 1979. The Program consists of work phases involving energy surveys, design, and installation of energy conservation measures to effect energy efficiency in approximately 2,906 buildings. It involves such things as installation of steam coils, plumbing and pump for energy recovery, renovation of automatic temperature control systems, thermal insulation, relamping, and energy recapture.

In fiscal year 1981, \$3.5 million was requested on specific project work on energy surveys, and retrofit. Only \$2.5 million was provided, necessitating deferment of design and construction work of retrofit projects identified in FY 1980. The level of funding provided will set back the Program's planned schedule and may require an additional year or two to complete.

Nature of Change: The Energy Retrofit Program will enable the upgrading of the energy efficiency of Federal facilities thus contributing to the goal of reducing the Nation's dependency on non-renewable energy resources and the attainment of a modern and efficient system of research facilities to advance agricultural research in all fields. It will reduce the need to divert program funds from ongoing program operations needed to accomplish essential agricultural research.

- (7) A net decrease of \$10,200,000 for construction of facilities (\$12,100,000 available in FY 1981).

- (a) An increase of \$1,900,000 for European Biocontrol Facility (-0- available in FY 1981).

Need for Change: Most agricultural pests such as weeds, diseases, nematodes, and insects in the United States came from other parts of the world, leaving behind them biological control agents. Now those natural enemies of pests need to be found, identified, and evaluated abroad; introduced into the United States; and incorporated into Integrated Pest Management (IPM) systems.

The demands for research on exotic beneficial organisms to support U.S. biological control programs are increasing rapidly. A major impediment to obtaining biological control agents is the diffuse deployment of overseas SEA biocontrol personnel in antiquated facilities. The European Parasite Laboratory (EPL), Paris; the Biological Control of Weeds Laboratory (BCWL), Rome, are in rented residences basically unsuited for research purposes. Inadequate facilities have led to the rejection of several vital research projects and the reduction of output in others. Resources are needed to consolidate the European effort at one location and to strengthen research in Europe and in the U.S. This will lead to increased efficiency in utilizing manpower and facilities.

Through the cooperative efforts of SEA, the State Department, the U.S. Embassy to France, and the French National Institute of Agricultural Research, a plan was developed to establish a modern biological control research facility at Valbonne International Research Park in southern France to replace the inadequate Paris and Rome laboratories. The proposed site of the new facility is adjacent to the biological control laboratories of the French National Institute of Agricultural Research (INRA) at Antibes. The Institute has a large staff and facilities, including quarantine-containment facilities.

Nature of Change: The increased funds will be used as follows:

- In fiscal year 1982, 4,000 square meters (43,055 square feet) of land will be purchased and an additional 6,000 square meters (64,560 square feet) will be leased, \$100,000;
- Costs for designing and constructing the facility is estimated at \$1.8 million.

(b) A decrease of \$12,100,000 for Nonrecurring Construction Authority.

Need for Change: The following construction items were funded in FY 1981 and will not be required again in FY 1982: additional construction at Stillwater, Oklahoma, \$1,000,000; additional construction at Beckley, West Virginia, \$1,000,000; and additional construction at Plum Island, New York, \$10,100,000.

STATUS OF PROGRAM

The Agricultural Research (AR) component of the Science and Education Administration is concerned with mission-oriented research to ensure an abundance of high-quality, nutritious, reasonably priced food and other agricultural products to meet domestic and world needs while maintaining environmental quality. AR uses coordinated, interdisciplinary approaches to conduct basic, applied, and developmental research in the fields of livestock, plants, soil-water-and-air resources, environmental quality, energy, processing, storage and distribution efficiency, food safety and quality, consumer service, and agriculturally related health hazards.

Research is conducted at more than 150 locations in the United States, Puerto Rico, Virgin Islands, and several foreign countries. Much of the research is conducted in cooperation with the State agricultural experiment stations, other State and Federal agencies, and private institutions.

RESEARCH ON ANIMAL PRODUCTION

Current activities: As the consumption of meat and animal products continues to increase in the United States and in the world, new technology is needed to enable livestock producers to increase production and thus to assure a reliable and safe supply of animal protein while, at the same time, reducing production costs. Research is conducted to improve the efficiency of producing healthy animals and safe, high-quality animal products through improved genetic and reproductive capacity; improved feeding and management practices; increased use of feed sources not eaten by man; improved design and use of equipment; and more efficient use of energy. Additional research is conducted to prevent and control diseases caused by infectious microbes, parasites, insects and other pests, and toxicants. Research is also conducted on ways to reduce the cost of rural housing construction and operation; the improvement of water and waste systems; and the reduction of problems caused by insects affecting man.

Research will emphasize basic approaches to help meet long-term objectives such as control of African swine fever, bluetongue, scabies and ticks; improvement of reproduction through integrating pathology, toxicology, physiology, nutrition and management; conservation of energy on livestock farms; and increasing lean meat deposition through understanding and manipulating the cellular processes of protein and fat synthesis and deposition.

Selected examples of recent progress:

Genetic male sterility is a promising new method of cattle fever tick control. Cattle fever ticks are continually being introduced from Mexico into Texas requiring continued control efforts. The ticks are also present in Puerto Rico and the U.S. Virgin Islands. We have recently discovered that interbreeding of two species of cattle fever ticks results in hybrids in which the males are sterile and the females pass the sterile male trait to their progeny. Laboratory trials have demonstrated that rearing and releasing hybrids into wild populations represents a potential new method of control.

A vaccine for Foot-and-mouth disease (FMD) is being developed by genetic engineering. If FMD were to gain entrance into North America, large amounts of a vaccine would be needed for its control. Pioneering work has shown that the virus protein, VP₃, is responsible for the protective effect of the crude vaccines currently produced. In cooperation with Genentech, Inc., the genetic information for VP₃ in the nucleic acid of the virus has been introduced into bacterial plasmids (organelles inside the bacteria). We hope that the bacteria which do not produce FMD can be grown to produce an inexpensive vaccine that will contribute to the control of FMD on a worldwide basis.

Development of high-producing lines of beef cattle increases return by \$38 per weaned calf sold. Selection for performance traits together with mild inbreeding has been effective in developing Line 1 Hereford beef cattle. Line 1 breeding was evident in over 65% of the 1,100 registered Hereford herds surveyed. Studies still in progress show that weaning weights of calves sired by Line 1 bulls have increased 40 pounds as a result of 20 years of genetic improvement in Line 1.

Locoweeds cause High-Mountain disease in cattle. This disease, also called Brisket disease, affects up to 5% of cattle residing in high mountain areas of the western U.S. Recently it has been shown that the consumption of locoweeds (certain species of the genera Astragalus and Oxytropis) can induce congestive heart failure in calves grazing at elevations of approximately 10,000 feet. The gross features of this condition include an enlarged heart, cirrhosis of the liver, edema of the chin and brisket, and accumulation of fluid in the chest. Death results if the animals are not removed from grazing these areas.

Photoperiod affects growth and fertility in rams. Ram and wether lambs that were reared under 16 hours of light grew faster and more efficiently than those reared under eight hours of light. When ewes were bred to Suffolk rams housed under short lighting before the breeding season, 35% more ewes lambed than when bred to rams that were housed under natural spring day length light. Thus the efficiency of sheep production can be increased greatly by controlling length of exposure to light.

Adverse effects of stress on body defense are mediated through hormonal influences on antibody. Various stressors, including high temperature, cause levels of antibody in the blood to be lowered. Stress increases the incorporation of corticosteroids (hormones produced by animals in response to stress) into the antibody-producing lymphoid cells. Corticosteroids are known to suppress the proliferation of lymphoid cells. This is probably the first step in the stress-related suppression of antibody production.

Reservoir for and vaccine against transmissible gastroenteritis (TGE) of swine developed. A 12-month abattoir survey of 8,000 feeder swine and breeding sows showed that a small percentage harbored TGE virus in their mouth. This finding suggests that the infection is more widespread than clinical evidence indicates and that carrier swine probably are a major source of infection. A cell-culture vaccine was shown to protect 86% of the pigs nursing vaccinated gilts, whereas nearly all control pigs died after challenge with virulent TGE virus.

Solar greenhouse residence proves effective in reducing heating needs. Tests conducted on three solar greenhouse residences showed that during the winter, solar energy provided 61% of the annual heating energy required for both the greenhouse and the residence. During colder periods, when one greenhouse was not heated at night and was used as a solar collector only, 72% of the house heat was supplied from this source. Greenhouse curtains are effective in reducing heat loss at night. In addition, the greenhouse acts as a buffer in shielding the house from wind and cold temperatures.

Major economic benefits could be derived from reduction of lymphoid leukosis (LL) infection in poultry. The LL virus is widespread but causes only a low mortality from tumors in laying chickens. Progeny of a flock were classified as positive or negative for infection at hatching and then reared to maturity. The LL infected chickens laid 28 fewer eggs per hen in a 20-week period and experienced 18% more mortality than their negative counterparts. Thus, reduction or eradication of LL infection in laying chickens promises to increase egg production as well as reduce mortality.

Product of bacterial fermentation controls cattle scabies. Attempts are being made to eradicate scabies, a skin disease caused by a mite, from cattle in the U.S. by dipping and quarantine. Intermuscular injections of an avermectin at very low doses (20 microgram/kg) rid calves of even heavy infestations of psoroptic scabies mites in less than two weeks. Live mites collected 24 hours after treating calves with avermectin were capable of infesting untreated calves, but mites collected three days or more after treatment did not survive. Animals could not be infested by the mite for at least 17 days after treatment. Avermectins, like antibiotics, are a product of bacterial fermentation.

Virus of ovine progressive pneumonia (OPP) is transmitted from parent to offspring. Maedi-Visna or OPP is a chronic disease of older sheep which can cause severe economic loss. We have shown that the virus which is widespread and can be transmitted by direct contact and through the milk, is also transmitted to the fetus before birth. Fetal infection before mid-gestation caused death and resorption or expulsion of the fetus; after mid-gestation, some fetuses were aborted near term but most were normal but infected at birth. The virus has also been isolated repeatedly from the joints of sheep with arthritis and is considered to be the most likely cause of this disease.

Farm of origin and treatment after shipment affect losses in stocker calves. Calves shipped from cow/calf operations to winter grazing may suffer severe losses from shipping fever. The farm from which the calves originate has a significant impact on the amount of weight lost during marketing and transportation, the incidence of disease, and the subsequent productivity of the calf. Extended periods of assembly prior to shipment decrease the physiological responsiveness to stress. Increasing the potassium level of the diet at the receiving station increased average daily gains, but the additional gain was due to increased water retention.

Dietary supplement of vitamin C is beneficial to weanling pigs. Weaning imposes drastic environmental, nutritional, and social changes upon pigs and man result in poor performance. Although pigs can synthesize their own vitamin C, supplementing the diet of pigs with vitamin C at weaning improves growth and feed efficiency. This observation suggests that the stress of weaning decreases the biosynthesis of the vitamin or increases its breakdown and loss, or both, resulting in a dietary requirement for vitamin C.

Exotic bluetongue virus isolated from cattle imported to the United States. The probable introduction of an exotic bluetongue virus into the U.S. was averted when imported cattle were found to be infected with this virus. These animals, which were among a group of 60 cattle from Brazil, had been extensively tested for a variety of diseases, including bluetongue, before they were shipped to Florida where they were held in quarantine for 150 days. After extensive and repeated testing, bluetongue type 4 virus, which is exotic to this country, was isolated from one animal. That animal and seven others were eliminated from the group. Bluetongue type 4 virus has been the cause of a number of particularly severe outbreaks of disease in various parts of the world.

New test and new vaccine developed for Texas fever. Texas fever, or Babesia bovis infection, has been eradicated from the United States but it still poses a threat to U.S. cattle. Also, cattle from the U.S. must be immunized if they are to survive in countries in which the disease is enzootic. In cooperative studies, an experimental, nonviable, tissue-culture derived, highly immunogenic vaccine has been developed against Babesia bovis. Since the vaccine is nonviable, it is the only vaccine that could be safely used in the U.S. if the infection is ever introduced from Mexico where it commonly occurs. A better test for the infection, which relies on the complement fixation test, has been developed.

Sulfamethazine contamination reduced from 15 to 5% in 18 months. Under the normal testing procedure at slaughter, USDA officials were finding a 10-15% violation rate for sulfamethazine in pigs reared on farms that were not using sulfamethazine in their diets. Research showed that sulfamethazine was being carried over into nonmedicated feed following mixing of a medicated feed. Results of this study were returned to producers for their use and implementation and resulted in a decline in sulfa violation rate to 5%.

RESEARCH ON PLANT PRODUCTION

Current Activities: Research is conducted to improve quality, production efficiency and production capacity of food, feed, fiber, industrial, florist, and nursery crops important to American agriculture. This will help assure continued availability of reasonably priced food, fiber, and agricultural commodities for domestic use and also develop an increasing potential for agricultural exports. Special emphasis in FY 82 will be on the collection, evaluation, and preservation of germplasm resources; improvement of genetic potential of crop varieties for total yield, quality factors, and tolerance to pests and environment stresses; development of integrated pest management systems and other means of improved biological control of serious insect, weed, disease and nematode problems; development of alternative sources of energy and energy conservation farming systems; initiation of new basic research on methods of plant reproduction, gene transfer, biochemistry of plant metabolism, host plant resistance, membrane function, plant growth and differentiation, and other physiological activities; and the conduct of research needed by regulatory and action agencies of the Department.

With the increasing use of marginal lands for agricultural production and additional plant stress resulting from this change in use of land resources, there will be additional emphasis in FY 82 on the basic research aspects of crop production. This will include research on the physical and metabolic responses to environmental stress associated with cold, heat, drought, excessive soil moisture, solar radiation, nutrient uptake, and plant senescence and dormancy. There also will be increased emphasis on germplasm maintenance, range management systems, energy related research on the use of sugar beets and sugar beet hybrids as sources for carbohydrates for conversion to ethanol, pesticide impact assessment, and research to support registration of minor use pesticides.

Selected examples of recent progress:

High lysine/protein rice developed from tissue culture. As food and feed, cereal grains such as corn, rice, and wheat are nutritionally limited by the very low levels of the amino acid lysine. Thus procedures are required for the selection of high lysine germplasm. SEA/AR scientists have designed and successfully tested tissue culture techniques to recover high lysine and protein cells from very large populations of cells grown in test tubes. These procedures increase the selection efficiency and greatly shorten the time required to make this genetic combination of characteristics. Instead of testing 20,000 plants from the field, the tissue culture procedures eliminate the unwanted lines, leaving only very small numbers of individuals with highly desirable germplasm. Using these procedures, scientists have recovered a rice line that is 42 percent higher in seed lysine and has 36 percent more protein than the original material.

High yielding high protein wheat germplasm identified. High yielding wheat varieties tend to be relatively low in protein, but new research has shown that this inverse relationship does not always hold. The Lancota variety and experimental line Nb 7060, both selected for high protein, were found in field trials to also have higher yield than conventional varieties. Lancota and Nb 7060 germplasms will be used in wheat breeding programs to increase yield and protein levels in other varieties.

Synthetic pheromone for Comstock mealybug is now available for use. A sex pheromone has been identified and synthesized for the Comstock mealybug; it is the first mealybug pheromone to be developed. Its synthesis is timely because it has immediate application in the field. The mealybug has become established in the San Joaquin Valley of California. Citrus, pomegranate and horticultural industries there have united to form a common interest group that will use the pheromone detection system to intercept the dispersing mealybug and limit its distribution. This action is beneficial to consumers and the environment because the cost and environmental impact of this program is minimal in comparison to other controls.

Potential biological control of seedling diseases in cotton. A bacterium with broad potential for control of seedling diseases was isolated from the surface of healthy cotton plants. Two antibiotics produced by the bacterium have been identified and are responsible for the bacterium's antagonism to soil-borne fungal pathogens. Treatment of cottonseed with the live bacterium increases the stand and vigor of cotton seedlings grown in soil infested with disease organisms. This control will make it possible to reduce the use of chemical fungicides to protect seeds.

Integrated pest management breakthroughs in the control of soilborne plant pathogens. Field technology has been developed for the integrated control of one major vegetable disease problem and is showing promise for the control of two others. Pickle fruit rot and diseases of beans and peppers, all caused by soil fungi, have been reduced using a combination of field plowing rather than disking, antagonistic biocontrol agents, and/or very small amounts of a fungicide. These breakthroughs represent considerable advances for solving disease problems for which no other accepted control measures are known.

Crested wheatgrass hybrids look promising. Hybrid breeding lines of crested wheatgrass, obtained from Agropyron cristatum and A. desertorum, have excelled in preliminary evaluation trials. The hybrid derivatives were superior to other crested wheatgrass varieties in seedling vigor and stand establishment in tests at Dubois, Idaho, and have demonstrated excellent productivity under semiarid conditions in Colorado. These varieties are expected to make a major contribution to the improvement of crested wheatgrass on western rangelands.

Combinations of copper endothall show potential for control of the aquatic weed hydrilla. Combinations of the aquatic herbicide endothall and an organically complex copper gave better control of Hydrilla verticillata than either compound alone. These results are from small-scale greenhouse experiments, but they suggest that field applications which produce 0.25-0.5 ppm endothall and 0.5-1.0 ppm copper may effectively reduce vegetative top-growth of hydrilla. This finding is of particular importance since hydrilla has invaded large portions of the Imperial Irrigation District in El Centro, California, poses a problem in Florida waterways, and is present in several other States.

Alternate system for nitrogen fixation in Azotobacter vinelandii. An alternate system for nitrogen fixation has been discovered in Azotobacter vinelandii bacteria. This system differs from known nitrogen fixing systems in that it does not have an apparent requirement for molybdenum. Thus, in the future, it might be possible to genetically construct rhizobial strains that can provide fixed nitrogen to their leguminous host plants where soils are deficient in molybdenum. This discovery is of extreme importance because it identifies a second class of nitrogen fixing enzymes not previously known to exist.

Pink bollworm controlled with sex pheromone. Plastic laminate flakes containing the sex pheromone, gossyplure, have solved the problem of maintaining the proper pheromone concentration where needed to control pink bollworm in cotton fields. The flakes were broadcast in treated fields in Arizona from July 14 to September 11. Compared to the non-treated control field, the flakes confused male moths so that there was a reduction of 93% in the number captured in gossyplure baited traps. In addition, there was a reduction of 68% in total larvae found in bolls in the treated fields and far fewer mated females and total moths were captured in flight traps. These research results indicate that the use of flakes to disperse the sex pheromone has great potential for advancing control methods of this cotton pest.

Tissue culture of fruit crops now possible. Basic research on growth and development of plant cells in tissue culture has led to the successful propagation of virus-free strawberries, blackberries, blueberries, and apples. This technique allows rapid and inexpensive propagation of these crops and has considerable potential for expanding high density plantings of tree fruits. The use of high density fruit plantings greatly increases per acre production which in turn reduces the cost of production to the consumer. Over 100,000 virus-free strawberry plants were propagated from a single plant at Beltsville, MD, during this last year and will be introduced as a new commercial variety.

A plant pathogen shows potential as a weed control in cotton. *Alternaria macrospora*, a plant pathogen, was evaluated in greenhouse and field studies to determine the feasibility of utilizing this fungus as a biological herbicide to control spurred anoda, an important weed in cotton. The feasibility of utilizing a biological herbicide for preemergence soil and postemergence applications of granular formulations of the pathogen was demonstrated. The pathogen was also applied as a foliar spray of spores. The foliar application reduced the number of spurred anoda plants in the field by 75 percent after six weeks and the remaining plants were severely stunted. Granular formulations applied preemergence to the soil or postemergence to foliage in small field plots resulted in essentially 100 percent infection of spurred anoda seedlings. This represents an important step in developing the concept of using plant pathogens to control weeds.

Potentially valuable biologically active compounds isolated. As part of a program of screening plants for possible pest control and medicinal constituents, several potentially valuable biologically active compounds have been isolated. Three plant extracts show particular promise. Fractionation work on *Trewia nudiflora* seed extract has culminated in isolation of four new compounds with potent antitumor properties as well as larvicidal activity against the European corn borer. Further fractionation of the extract of *Cephalotaxus mannii* has provided three new anti-leukemic compounds. Extracts of yellow oleander (*Thevetia thevetioides*) were found to be a potent larvicide towards the European corn borer.

Factors determined for variation in aflatoxin contamination. Studies indicate that the incidence of aflatoxin contamination in corn is high and fairly consistent from year to year, but insect and weather conditions during ear development are principal factors in determining the variable levels of contamination. Improved inoculation and sampling techniques have achieved increased reliability in screening for resistance to *A. flavus* infection and aflatoxin production. Existence of genetic variability for resistance to aflatoxin development has been verified and corn diallels are being evaluated to determine types of inheritance.

Possible control of aflatoxin in corn. Innocuous compounds naturally present in corn ears at low levels have been found to inhibit the growth of *A. flavus* which produce the acutely toxic and extremely carcinogenic aflatoxins. Thus,

breeding could presumably enhance levels of these compounds so that the aflatoxin problem in these corn varieties may be significantly reduced. This presents an exciting possibility for the control of aflatoxin in corn.

Fungicide used to control tall fescue toxicosis. Eleven parental clones of the Kenhy variety of tall fescue were treated with benomyl, a systemic fungicide, to control the fungus Epichloe typhina. Seed of the treated clones had 70% less loline alkaloid content than seed of untreated clones. Removal of E. typhina from tall fescue and the reduction of loline content in the forage could correct the summer fescue toxicosis problems for cattle. Control of this problem would double or possibly triple the present production of the 2 million young cattle feeding on tall fescue.

Rapid unbiased spray measurement method. A laser beam is being used in a new method to measure droplet pesticide sprays. Previous methods required collecting spray on slides or cards for measurement. This resulted in frequent failure to detect many small droplets which were not collected. The new method uses a laser beam which shines through the spray cloud in mid air. The droplets passing through the beam cast shadows which are measured instantly. The system permits millions of droplets to be measured per minute and removes the bias caused by other collection processes, thus greatly increasing the accuracy of size measurements while assuring pesticide efficiency and environmental quality control.

Gibberellins increase sugarcane yields. SEA/AR scientists recently discovered that gibberellin, a natural growth regulator, can be used to increase sugarcane yields by an average of 5 tons per acre and sugar yields by 0.5 tons per acre. The gibberellin application costs the farmer about \$40 per acre. Thus at current prices, the farmer can realize a nine-fold return for his investment for gibberellin applications. Additional research is needed to better understand the role of gibberellin in the biosynthesis of carbohydrates in the sugarcane plant.

Use of altered atmospheres to control stored product insects to be available to producers. A petition to establish an exemption from the requirement of a tolerance for the use of nitrogen, carbon dioxide, and combustion gas to control stored product insects on raw agricultural commodities after harvest was developed in the minor use pesticide program (IR-4) and submitted to the Environmental Protection Agency. This technology will reduce the dependence on the chemical fumigants now in use. It provides for commercial utilization and legal use of a nonchemical method of controlling insect pests that has been available in other countries since the Second World War.

New accessions of nitrogen-fixing bacteria from China. The USDA has recently obtained nitrogen-fixing isolates from soybean nodules obtained from the Peoples Republic of China. Until recently, new accessions of Rhizobium japonicum from China (the center of origin for soybeans) had not been available. These new accessions have been added to the USDA rhizobium culture collection and are currently being evaluated in the greenhouse and field. Expectation is that they will be exceptionally available in improving the nitrogen fixing potential of certain economic plants.

Boll weevil strain selected that can better tolerate gamma rays. Gamma rays from radioactive cobalt are used to induce sexual sterility in boll weevils. Gamma rays destroy the dividing cells in ordinary boll weevil. SEA/AR scientists at Fargo, ND, in cooperation with the University of North Dakota have developed a radiation-tolerant strain in which almost twice as many individuals survive irradiation for two weeks than ordinary weevils. This holds promise for increasing the efficiency of large scale sterilization of boll weevils for use in control programs.

Breakthrough made in developing cold-hardy citrus. In an effort to broaden the genetic base of commercial citrus varieties, SEA/AR geneticists have crossed grapefruit with an inedible cold-hardy citrus species, Poncirus trifoliata, and made backcrosses between the resulting hybrids and low-acid sweet orange. New second generation hybrids have been selected which have fruit that look like a sweet orange; are edible; have soluable solids, acids, and other quality characteristics similar to commercial sweet oranges; and the trees are more cold-hardy than sweet orange. This research represents a breakthrough in genetic engineering of citrus by providing edible citrus with one-fourth of the genetic base derived from a cold hardy species.

Automatic, intermittent sprayer reduces pesticide usage. A new photoelectrically-operated, automatic, intermittent sprayer uses infrared sensors to detect plants and programmable electronic circuitry to regulate the release of sprays on individual plants. This equipment controlled insect pests of cabbage, cauliflower, and peppers as well as a conventional sprayer, but used 30-50% less pesticide. These results indicate the extent to which excessive pesticide applications can be reduced by precisely applying pesticides onto desired targets.

Technology developed to accelerate breeding of cotton varieties resistant to the tobacco budworm. Small budworm larvae produced in artificial rearing facilities are mixed with corn cob grits and applied with a special inoculator for cotton plants growing in the field. Last summer at Mississippi State, MS, over 100,000 cotton plants were inoculated weekly for two months and large differences for resistance to larval feeding were observed between plants. The procedures, which are simple, cost effective and rapid, will make it possible for seed breeding programs to accelerate the development of budworm resistant cotton varieties for growers. Resistant varieties will reduce the need for chemical insecticides.

New low-alkaloid line of reed canarygrass gives increased gains of grazing lambs. Cooperative research between SEA/AR and University of Minnesota scientists has produced a new reed canarygrass that has less alkaloids than existing varieties. These reduced alkaloids helped increase daily weight gains ranging from 42 to 69 percent in grazing sheep. Additional experiments are now in progress to test cattle response to this new line.

Adjuvant developed which improved efficiency of biological control agents. A feeding stimulant containing cottonseed products increases the effectiveness of Bacillus thuringiensis and nuclear polyhedrosis virus for control of several lepidopterous pests. SEA/AR scientists cooperated with various State, commercial, and other Federal scientists and field personnel in trials of the adjuvant in determining its efficiency across the cotton belt. Approximately \$500,000 worth of the adjuvant was marketed under the tradename COAX® in 1979. Widespread use of the adjuvant should result in increased use of microbial insecticides and reduced use of broad spectrum pesticides in programs to control insects on cotton.

Plant introduction records computerized. Crop germplasm collections totaling 436,990 items have been described and recorded through use of a newly implemented computer program. Printouts which list these plant materials have now been distributed to germplasm curators and scientists throughout the United States. This initial Plant Introduction documentation provides the primary reference point for all material coming into the entire National Plant Germplasm System and hence this accomplishment is a major step forward in future computer linkage among the Plant Introduction office, germplasm curators, and the user community.

Beneficial fungus provides biological control of a lettuce disease. Application of a beneficial fungus to lettuce field plots in 1978 reduced by 94% the population of the fungus which causes lettuce drop. During 1979 83% disease control was obtained without further addition of the beneficial fungus.

Non-chemical control of greater wax moths developed. The greater wax moth is a serious insect problem to beekeepers and there has not been an effective means of non-chemical control. SEA/AR scientists have now developed a product containing Bacillus thuringiensis, a naturally occurring bacteria which was found to be effective against the wax moth. This product can be used in beehives occupied by bees with no adverse effects. The data collected are being used to obtain approval of a label from the Environmental Protection Agency.

Sex attractants identified for important insect pests. SEA/AR scientists have identified and synthesized sex attractants for the white peach scale, Comstock mealybug, citrus mealybug, avocado leafroller, cranberry girdler, armyworm, western yellowstriped armyworm, alfalfa looper, filbertworm moth, and alfalfa seed chalcid. These attractants are used by growers to detect the presence of these pests and to schedule insecticide applications.

New varieties increase potato production in the East. The high solids, high quality, widely adapted, pest-resistant Belchip potato variety continues to increase in popularity. Seed demand far exceeds the supply, in part, because of its excellent chip quality and high resistance to tuber heat necrosis. BelRus, a medium late maturing, very high quality russet variety, resistant to major potato viruses, is in major demand in the Northeastern and Mid-Western United States. BelRus is expected to complement the Russet Burbank variety in production east of the Rocky Mountains as a fresh market and processing variety. Delta Gold, a high solids, high quality, yellow-flesh variety, will improve the Northeast potato producers opportunity for seed and table stock export to foreign countries preferring a yellow-flesh potato.

RESEARCH ON THE USE AND IMPROVEMENT OF SOIL, WATER, AND AIR

Current Activities: Research is conducted to conserve and improve the quality of soil, water, air, and other renewable resources associated with the Nation's cropland, rangeland, and noncultivated areas. Much of this research deals with developing better management systems and strategies that optimize the production of food and fiber, minimize the adverse effects of agricultural systems on the environment, and assure the efficient use of our soil, water, and air resources for future generations. Investigations include reducing salt damage to soils, crops, and water; improving irrigation and drainage of agricultural land; developing tillage practices for improving soil properties and crop growth; managing and using precipitation and solar energy for crop production; reclaiming and revegetating land areas disturbed by man; utilizing, managing, and conserving soil fertility for increased production and nutritional quality of plants and animals; preventing pollution of and improving the quality of soil, water, and air; controlling erosion by water and wind, and sedimentation; and conserving and managing agricultural water resources. Much of this research deals with understanding the basic physical and biological processes involved so that the response of agricultural systems can be accurately interpreted, and models of these systems can be developed which have regional and national application as planning and management tools.

Soil, water, and air research affects many problems relating to both agricultural and nonagricultural needs. Major thrusts of this research include studies on non-point source pollution; applying agricultural, urban, and industrial wastes to agricultural lands; using crop residues for erosion control and energy production; effects of tillage and nitrogen efficiencies on crop production; application of remote sensing technology to meet agricultural information needs; efficient irrigation, and the management of water resources. Additional Emphasis is

being placed on maintaining the productivity of soils, understanding the mechanisms involved in nonpoint source pollution, and on applying remote-sensing technology to agriculture. The primary justification for the emphasis is the need to expedite the development of farm management systems that provide the farmer and the land-use planner with improved information for decisionmaking.

Selected Examples of Recent Progress:

Basic research explains salt-induced plant growth depression. Basic research has provided a conceptual model of salt-induced plant growth depression based on the premise that chemical energy normally consumed in biosynthetic processes of plant growth is diverted to osmotic adjustment in plant cells. Experiments with tomato and safflower plants showed a significantly higher energy consumption by salt-stressed plants. These results are expected to speed the development of salt-tolerant varieties and cultural practices to minimize salt effects on crop production.

New crop and water management system increases production from limited irrigation water. A new management system that combines the best of irrigation and dryland water conservation practices has been developed for the Southern Great Plains. This system involves a graded furrow field whose upper half receives normal irrigation, the next quarter receives runoff from the upper half, and the lower quarter receives only rainfall. Furrow dams are used to prevent runoff from the field. The grain sorghum production the first year was doubled that obtained with conventional surface irrigation that had 35 percent runoff, and was 32 percent greater per unit of irrigation water absorbed by the soil.

Method developed for improving flood flow estimates for ephemeral streams. At the specific request of the Soil Conservation Service, a procedure has been developed for assessing the effect of transmission losses on the rates and volumes of flow in ephemeral streams. Transmission losses are an important factor in moderating downstream flooding in many of the arid and semiarid regions of the western rangelands. The procedure has been accepted by SCS and after a 6-month trial period conducted by their field engineers will be incorporated in their Engineering Handbook.

Mechanism found for plant tolerance of herbicide. Triazine herbicides are essential for weed control in minimum tillage in many parts of the United States. Weed resistance to this compound has caused considerable concern. Biochemical data have demonstrated that in resistant plants the active site for triazine herbicides has selectively been modified so that its affinity for triazines has dramatically decreased. These data help to explain the mechanism by which herbicide tolerance has developed and spread throughout various parts of the U.S. and Canada.

"Slit-Planting," a new tillage and planting system. "Slit-planting" shows promise for use in soil, water, and energy-conserving cropping practices. In this system, a vertical slit cut through compacted soil layers, such as tillage pans, provides a channel for the downward growth of plant roots. Soybeans planted over slits produced 61 percent more beans compared with those grown without slits the first year. Soybean taproots reached the bottom of the slit within 1 week and proliferated through the subsoil. Roots on beans without slits were severely restricted by the compacted soil.

Temperature stress during grain filling identified for wheat. Environmental stress, both water and temperature, are frequently the cause of reduced crop production. To better define these factors, research has shown that each 1 C increase in air temperature above the optimum 15 to 18 C range during grain filling shortens the duration of filling of wheat by 3 days and decreases final kernel weight by about 1.5 mg. Thus, temperature stress affects grain filling whereas water stress influences kernels produced per unit area during the period preceding grain filling. This distinction in

plant response may help to separate the effects of water stress from temperature stress under field conditions. These findings imply that genetic variability in plant senescence and grain filling rates might be used to stabilize the kernel-size component of yield.

Plant water stress index developed. The soil-plant-air-water (SPA) model for estimating the effect of water stress on corn yields was tested. Two transects, one across northern Missouri and Kansas and the other across northern Iowa and eastern South Dakota, were represented by 49 study sites and 11 years of data, 1967-1977. The computer water stress index values and observed county corn yield correlated well for all study locations. This daily soil moisture budget approach of SPAW provides good sensitivity to available crop water and climatic water stress.

Promising method developed for controlling erosion from frozen soils. In the Pacific Northwest, erosion control is widely accepted as one of that region's major resource-management needs. Research has demonstrated that frozen-ground runoff is responsible for most of the erosion from winter-seeded fields. A tillage treatment that produces parallel slots in the soil about 5 to 10 cm wide and 20 to 25 cm deep filled with compacted crop residues has been tested and appears to perform well as a conservation practice for reducing both runoff and soil loss from frozen soil. Plot data suggest that the slot-mulch treatment has the potential to reduce runoff and soil loss from treated areas to less than 10 percent of that from untreated fields.

Micro-ecosystems for determining fate of pesticides in the environment. Field evaluation of the environmental effects of pesticides is both costly and time consuming. Micro-ecosystems have been designed to evaluate pesticide dissipation in soils, including losses from volatilization. Both intermediate and larger-size micro-ecosystems have been developed -- the larger ones are designed to accommodate plants. Systems can be modified to meet specific objectives. Initial studies on volatilization losses of 11 compounds showed that the more volatile compounds volatilized rapidly initially, then tapered off. Less volatile compounds volatilized at a more uniform rate. These results compared favorably with field data. These micro-ecosystems provide a cheaper and faster method for acquiring environmental data on pesticides and complement the previous development of aquatic ecosystems.

Corn uses water more efficiently than sorghum under adequate irrigation but not under limited irrigation. Four-year average corn yields were 20 percent higher than grain sorghum when adequately irrigated. Under water stress conditions, corn yields were reduced nearly twice as much as grain sorghum yields for comparable reductions in evapotranspiration. These results indicated that grain sorghum should be grown, instead of corn, where water supplies limit full irrigation and when severe plant-water-stress periods are expected.

Nitrogen recovery can be greater under no-tillage in years of soil water stress. A summary of 4-year results, comparing no-tillage with conventional tillage for corn silage production, showed that yields, nitrogen uptake from soil and fertilizer, and percent recovery of fertilizer nitrogen were greater under no-tillage during years of soil-water stress. In years of adequate rainfall, these parameters were unaffected by tillage. Cultivars of alfalfa and soybeans, with the highest biological nitrogen-fixing abilities, were propagated in the field to further evaluate this capability, using both ^{15}N -depleted labeled sources. Further evaluation of various rapid chemical tests in relation to biological measurement for assessing soil nitrogen availability is in progress.

No-tillage practices reduce environmental hazards. Runoff from three instrumented watersheds has been measured over 6 hydrologic years; the first 3 years having clean-till cropping and the last 3 years a no-tillage culture of small grain and a crop of grain sorghum or soybeans grown in sequence each year. The annual number of runoff events was reduced by no-tillage culture. Measured sediment was also reduced by no-tillage. Orthophosphorus and chloride concentrations increased significantly, and total nitrogen and ammonia nitrogen decreased under no-till system as compared with clean till. Since drastically reduced runoff volumes were associated with no-tillage, the chemical load delivered in runoff was reduced.

Movement of chemicals through stratified impoundments successfully modeled. Sediment and agricultural chemicals trapped in natural and manmade structures across the landscape greatly affect watershed sediment yields and the quality of runoff water from agricultural areas. Because a substantial proportion of the water reaching our major streams and rivers is channeled through lakes and impoundments, these structures must be considered in predicting the effect of agricultural activities on downstream water quality. A mathematical model has been developed to describe the movement of sediments and dissolved chemicals in and through density-stratified impoundments. This is a major contribution to developing improved methodologies for predicting the sediment and chemical trapping efficiencies of small reservoirs, lakes, and ponds.

Runoff curve number determined using landsat data. The land cover requirements of the SCS runoff curve number model used to develop volume of runoff for hydrograph synthesis in suburban areas were modified so as to be compatible with Landsat digital data. Model results obtained with these Landsat land cover data compared well with those obtained using conventional data. Synthetic flood frequency relationships computed for a test watershed showed that the Landsat-based data agreed well with the conventional data based on aerial photos for determining the SCS runoff curve number.

Trenching of sewage sludge, a viable land disposal alternative. A trenching method has been developed and evaluated for 5 years as an environmentally safe land disposal method for municipal sewage sludge. The process has the advantage of a high disposal rate with minimal surface runoff and odor problem, and has been recommended for high metal sludges that cannot be surface applied to agricultural land. Extensive monitoring showed that nitrate occurred only in trenches where upper portions had dried to 50 percent solids. Heavy metal losses from trenches were minimal. No apparent pathogen hazards were found when a limed sludge was entrenched. This process is currently being used by Montgomery and Prince George's Counties, Maryland.

Estimates of solar radiation compared with ground-level observations. An atmospheric radiative transfer model and an energy balance model were applied to operational meteorological satellite data of scene brightness and cloud amount collected by Great Plains Council participants and the National Oceanic and Atmospheric Administration-National Environmental Satellite Service during a 63-day test. Model estimates of solar radiation reaching the ground were compared with ground-level observations made at 20 sites on the Great Plains. Correspondence between model predictions and ground observations was good and demonstrated the potential for an operational system for estimating solar radiation.

PROCESSING, STORAGE AND DISTRIBUTION, FOOD SAFETY AND CONSUMER SERVICES RESEARCH

Current activities: The research program is targeted to provide the consumer with the highest quality agricultural products that are low cost and safe through new technology to stimulate development and innovation in marketing, transportation,

processing, storage, and consumer services. Primary goals of the research are to reduce losses, protect the environment, increase exports, improve productivity, conserve energy, optimize nutrients and quality, insure consumer and worker safety, and enhance the family quality of life.

In the pursuit of these goals, emphasis is placed on basic research and research that is responsive to the stated needs of action and regulatory agencies. Considerable shift in emphasis has been made in Post Harvest Science and Technology programs. Additional basic research programs will be conducted that will provide a more complete understanding of fundamental biological processes in agricultural products and commodities after harvest to improve food quality and to understand the mode of aflatoxin contamination. Methods will be sought to prevent or control aflatoxin production. Also, resources will be applied to developing more effective methods for conversion of biomass to gaseous and liquid fuels, with special attention to on-farms pretreatment and processing; to develop alternatives to nitrite such as food irradiation; to develop more rapid instrumental and chemical techniques to monitor toxic and drug residues in meat and poultry; to assure the quality of soy beans; and to ensure the safety of grain elevator workers and inspectors. Increased efforts will be directed to development of quarantine treatment methods for destroying unwanted plant pests in fruit and vegetable cargoes and sensitive instrumentation to detect agricultural contraband in luggage entering the United States. Research will be expanded on freshwater fish farming to convert processing wastes into a high-protein concentrate meal and oil. Additional effort will be aimed at supporting export commodity programs and on the identification and elimination of causative factors of byssinosis, a health concern in cotton textile mills.

Selected examples of recent progress:

Reduced mutagenicity of ammoniated product of aflatoxin B₁. Aflatoxin B₁, a potent carcinogenic mold metabolite found as a natural contaminant in oilseeds, threatens their use as foods and feeds. Ammoniation has proved an effective means for destruction of this toxin. However, data must substantiate the safety of products made by this treatment. Recent biological tests on the product formed during ammoniation of aflatoxin B₁ indicates the carcinogenic properties are removed. This basic information offers regulatory agencies the much needed supportive documentation necessary for approval of ammoniation as procedure that is safe for use on products entering the food and feed chain.

Dietary trypsin inhibitors under study. Trypsin inhibitors are proteins found in foods such as eggs, potatoes, peas, beans, and soybeans. In rats, mice, and chicks, trypsin inhibitors stimulate excessive secretion of pancreatic juices and cause the pancreas to enlarge and retards the growth of the animal. The inhibitors are largely inactivated when food is cooked, but some are comparatively stable to heat and 5-20% of original activity remains in commercial products prepared from soybean protein. Four-week feeding studies with rats show that the residual levels which remain after cooking affect neither pancreas nor growth. Long-term ingestion of soybean proteins and other foods that contain trypsin inhibitor are now being studied cooperatively by two SEA-AR research centers and the University of Minnesota.

Relationship of drought stress to aspergillus flavus invasion of peanuts. The factors associated with the invasion and establishment of species of the Aspergillus flavus group (producers of aflatoxin) in peanuts are minimally understood. A major cooperative project involving Federal, State, and industry personnel has been initiated to determine the numbers and kinds of microorganisms that are present in the peanut root zone, and the effect of environment (particularly during drought and high temperature conditions) on the invasion of Aspergillus flavus in the soil before the peanuts are harvested. Such studies are expected to identify the optimum environment that will prevent the invasion of toxin producing microorganisms into the peanut kernel.

Detecting insect infestations in export foods and grains. Detection of emigrant insect species in foods and grains destined for international markets is a primary step in improving the quality of goods. An infrared carbon dioxide gas analysis method of detecting hidden insects has been developed and patented. Prototype detectors are under evaluation by two major instrument manufacturers. Cooperative studies between SEA-AR, the Federal Grain Inspection Service, and the instrument manufacturers have demonstrated the superior capability of this method over conventional grain inspection procedures. Under development is a computerized, fully automated, detection system to monitor insect infestations in bulk grain storage facilities.

Carbon dioxide used commercially to kill insects in stored wheat. A commercial facility located in Texas, seeking a residue-free insect protectant, treated 65,000 tons of wheat with carbon dioxide for destruction of insect life. This was a cooperative effort involving SEA-AR scientists in a supervisory role with engineers from a major U.S. grain company and a producer of carbon dioxide gas. Carbon dioxide modified atmospheres have been used to kill insects in grain in several countries, but this treatment is believed to be the first large scale commercial use in the U.S. Insects inside the grain kernels as well as those in the free air space of the storage structure were killed in the carbon dioxide modified atmosphere.

Ventilation of tobacco storages for winter season control of cigarette beetles. An analytical and empirical computer model has been developed for analysis and comparison of active and passive ventilation systems to chill tobacco hogsheads during winter months for destruction of cigarette beetles. The model predicts that ventilation efficiency of a passive thermal syphoning system is such that the cost of enveloping existing storage structures with additional vertical walls can be written off in a 10-year period through reduced energy consumption. A large scale ventilation experiment was initiated in the fall of 1980 in an 800,000 cubic foot storage to verify predicted ventilation rates and laboratory data on cold air control of cigarette beetles in hogsheads.

Acute effects of cotton dust exposure reduced by washing. SEA-AR scientists and a medical team from the National Institute of Occupational Safety and Health have demonstrated, through the use of human challenge tests, that the acute response to cotton dust exposure can be significantly reduced by washing the cotton prior to processing. Exposure to moderate levels of dust generated during processing of raw cotton results in a temporary loss of lung capacity for a large proportion of healthy individuals following a 6-hour period of sitting in the controlled atmosphere of a model cardroom. The same group of individuals lost little or no lung capacity when exposed to dust generated in processing of cotton washed under relatively mild conditions. Although not conclusively proved, it is suspected that the acute response to dust may be related to the chronic condition known as byssinosis which, for a few individuals, occurs after many years of working in a cotton textile mill. Plans are now in progress to make further use of human challenge tests in an effort to determine the longer range effects of washing as a practical means for reducing the health hazard of cotton dust exposure by removing the causative agent(s).

Potential methods for the detection of contraband. New studies have been launched and excellent progress obtained on the detection of contraband foodstuffs in luggage that may carry exotic diseases and pests. Volatile compounds in the aromas of unwanted materials are being identified with the latest instrumental analytical methods. The solution envisioned to the detection problem is a system which could operate in the terminals of international airports based on the instrumental identification of aromas and other volatiles emitted by the contraband materials. The first line of defense is the detection and exclusion of contraband fruit and meat products

from luggage of incoming travelers. Importation of exotic diseases and pests could cause costly and devastating damage to U.S. agricultural crops and livestock.

Inexpensive, small scale solar dryer for use by small farmers and gardeners. A dryer easily constructed with handtools from readily available materials has been developed. The dryer operates on the principle of a unique parabolic trough-type reflector to increase radiation on the product and shorten drying time. Drying rate is substantially reduced and the special design includes protection of the product from damage by rain. There is a sizeable demand for the how-to-do-it-instructions.

Safety assurance in home canned foods. Selection of safe and appropriate home canning procedures requires knowledge of the acidity of the food to be canned. High acid foods may be processed at boiling water temperatures; however, low acid foods must be pressure cooked. While the acidity of individual foodstuffs is well known and available, people often can mixtures of vegetables or combinations of vegetables with meat, and no means has been available to them for judging the acidity of such mixtures. Hazards may exist if such food combinations are not canned properly. SEA-AR scientists have developed a computerized data bank that relates recipes, and nature and proportions of ingredients to the acidity of the final food mixture to be canned. By using this information, safe procedures can be selected by SEA-Extension to guide recommendations in educational efforts or in response to inquiries from individuals.

New type of raisins results from faster drying method. Spraying grapes with an edible fatty acid ester was shown by SEA-AR scientists to speed grape drying and thereby reduce exposure of raisins to potentially destructive early season rains in California. The raisins are lighter colored, more tender, and rehydrate faster than conventional raisins. Keen interest in this superior commodity is being demonstrated by domestic and foreign marketers who are testing consumer acceptance. Application of the process would reduce jeopardy to the \$333 million raisin crop in California.

Breakthrough in hormonal control. A compound has been identified which inhibits production of the plant hormone, ethylene. The use of this compound prevents early fruit tree flowering, thus reducing the risk of spring frost injury; decreases apple fruit "drop," thus increasing yield; lengthens the storage life of fruit; and extends the vase-life of cut flowers.

New technique developed for catfish processing waste. Farm production of catfish, a relatively unknown enterprise a decade ago, is fast becoming one of the largest segments of American freshwater aquaculture. Disposal of catfish processing waste is becoming a serious problem. A new treatment to convert catfish processing waste into high-quality byproducts has been developed. The new process involves liquefying the waste with naturally-occurring visceral enzymes which are activated by small amounts of acid, screening out bones after low temperature digestion, removing oil by centrifugation, and removing most of the water by vacuum evaporation to produce a high-protein concentrate. This concentrate can be used directly as an animal feed supplement, pet food flavoring or it can be further dried to a meal. The new process offers several advantages over conventional rendering methods: lower temperatures are used; the dried meal contains about 80% protein; energy requirements are kept low because of lower temprature processing and use of high-efficiency evaporators; the process is simple and requires no specialized equipment. Two large catfish processing companies are now jointly building a liquefaction plant to convert their wastes into fish feed supplements.

Egg shell stress sensor developed. To help minimize losses by the commercial egg industry due to shell breakage, a transmitter-equipped artificial egg has been designed to go through a typical egg processing line. As the test egg is abused by the processing line, a radio signal is emitted that helps pinpoint high-stress areas in the processing line needing improvement.

New use for lactose. Lactulose, a sugar of potential commercial importance to the pharmaceutical and food industries, was synthesized by a new procedure from lactose, a major component of whey. Presently, millions of pounds of whey produced from cheese manufacture are not well used. This new method gives better yields than present methods and pure lactulose is easy to separate from the reaction mixture. Lactulose is very soluble in water, is a non-nutritive sugar about half as sweet as sucrose, and may not cause dental caries. Besides being a prescription laxative, lactulose is also used to treat a disorder of the liver.

Alcohol from crop residues. The use of cellulosic biomass for fermentation to alcohol for alternative fuels depends on rapid, economical conversion of cellulose to fermentable sugars. However, the cellulose is trapped in lignin, a natural cement surrounding the cellulose, which makes it inaccessible to the enzymes that convert it to sugar for fermentation. SEA scientists recently discovered bird's nest fungus which is effective in breaking the cellulosic bond. The fungus removes 45% of the lignin and expose 61% of the cellulose to digestion to glucose by enzymes. A white-rot fungus, Cyathus stercoreus, has been found which digests the lignin in lignocellulosic residues exposing the cellulose. The current process is slow, but attempts to adapt the organism to more rapidly remove lignin have already reduced the time involved in freeing the cellulose by 70 percent. The fungus that remains after growing on the intractable residues could be used as a protein-rich feedstuff.

Hydrocarbon and nicotine content of tobacco smoke reduced by ozone treatment of leaf. Components of tobacco leaf responsible for formation of much of the tumor-producing hydrocarbons in cigarette smoke were effectively decomposed by exposing the leaf to ozone. Ozonization treatment produces leaf yielding tobacco smoke with 83% less hydrocarbons and 87% less nicotine. Ozonization of tobacco leaf is a new approach for development of a less hazardous cigarette.

Discovery of the source of a carcinogen found in the atmosphere of a tannery. In 1978 the National Institutes of Occupational Safety and Health discovered nitrosodimethylamine (NDMA) in the atmosphere of a tannery. NDMA is known to be a carcinogen in a variety of animals. The levels of NDMA were the highest ever found in an industrial workplace. A team of SEA-AR scientists organized an investigation to confirm these findings and to discover the source. Nitrosamine analysis is a highly specialized field, but within several months the presence of NDMA was confirmed in a number of tanneries. Within a year its source was established as a dimethylamine compound used as an unhairing agent by some tanners. This information has been disseminated to the industry. The major manufacturer of this product has issued a warning on the use of this material and is now marketing a new product to take its place. The result illustrates the timely and useful translation of research results into action programs by industry. Nitrosamine research pursued initially by SEA scientists to ensure safety of cured meat has resulted in reduced worker hazard in a leather tannery.

Adaption of existing techniques and development of new methodology for measuring family economic well-being. The development of these measures is part of a redirection in the focus of family financial management research that will take into account economic and family changes over the life cycle. In themselves, these measures are valuable tools in explaining differences in family economic characteristics such as saving, spending, and employment patterns. They are useful in assessing the impact of various social and economic problems such as the food stamp and WIC programs.

HUMAN NUTRITION

Current Activities: The major program in human nutrition research within SEA, and the responsibility for coordinating human nutrition research and education among USDA agencies, rests with Human Nutrition. To capitalize on all available expertise and to make best use of the limited resources available, it is necessary to carefully coordinate the work of several groups within the Department. Research and evaluation projects exist in ESS and FNS, as well as within SEA. Nutrition information and education projects exist in FNS, FSQS, ESS, OGPA, and SEA.

Nutrient needs vary according to age, sex, physical activity, and health status. Using both human subjects and animal models, investigators are determining the ranges in levels of nutrients needed by humans. Emphasis is being placed on the special needs of infants and young children and the elderly.

Studies are being conducted on nutrient content of foods, biological processes that influence availability, and interactions among nutrients and other dietary components, such as fiber. New and increasingly sophisticated techniques and instrumentation are also being developed as an integral part of these studies.

Determining what people eat and the levels of nutrients in their diets is the focus of several major surveys and many related studies. Information from these projects is used in developing methodologies for assessing nutritional status and the factors that influence it, and developing new and innovative nutrition information and dietary guidance concepts and materials.

Knowledge gained about people's nutritional needs at various stages in life, their food consumption patterns, and the nutritive value of the food they eat, is applied in many ways from establishing standards for Government food and nutrition programs, to developing guidelines that help people know what foods to eat for a healthful diet. The results of these research and education programs are used by numerous groups, including consumers, the scientific and medical communities, nutritionists and dietitians, and Government agencies such as the Public Health Service, the Food and Drug Administration, and USDA's Food and Nutrition Service.

Selected Examples of Recent Progress:

Iron Content of Meat: Recent data demonstrate that pork contains 70 percent less iron, and beef 20-30 percent less iron, than previously reported. Such data require a reconsideration of prior estimates of iron requirements. The latter are based in part upon the health status of individuals consuming diets of varying iron content.

Vitamin B₆ Analysis: A new method for the analysis of vitamin B₆ has been developed, which allows the determination of all vitamers of B₆ in food samples, animal tissues, and blood. Since the various forms of vitamin B₆ may have differing biological activity, and vitamin B₆ is believed to be marginal in many diets, these findings will allow a more definitive appraisal of B₆ intake and nutritional status.

Inorganic Chromium Absorption: Inorganic chromium has been reported to be poorly absorbed by experimental animals and man. However, recent results indicate that the absorption of supplemental inorganic chromium is similar to that of chromium found normally in foods. This represents a major development in the field of chromium research, particularly since there are now indications that the level of chromium intake may influence serum cholesterol levels.

Nationwide Food Consumption Survey: Data from USDA's 1977-78 nationwide food consumption survey have been compiled and released to the public. Preliminary reports summarizing the data from the Spring 1977 portion of the survey have also been prepared on household food use and the food intake of individuals. A comparison of data from the Spring portion of the 1977 survey with that of the survey taken in 1965 indicates that calories available in households declined about 10 percent. At the same time nutrient density of the food consumed increased, as levels of all vitamins and minerals except for calcium were the same as or higher than in 1965.

Picolinic Acid and Dietary Zinc: In studying children with acrodermatitis enteropathica, a genetic disease that impairs zinc absorption, researchers discovered that mother's milk is effective in preventing its symptoms. Further investigations revealed that mother's milk contains relatively large amounts of a substance called picolinic acid, which significantly aids the absorption of this important nutrient. Subsequent laboratory studies with rats showed that normal absorption of zinc depends upon an adequate dietary supply of tryptophan and vitamin B₆--substances necessary for the synthesis of picolinic acid. Zinc intake is thought to be marginal in many diets; these findings may allow a more thorough understanding of zinc intake and nutritional status.

Nutrient Interactions Studied: In adult men fed a mixed Western diet, absorption of calcium, phosphorus, and copper decreased with increased intakes of dietary protein and fiber. Further research showed that fiber alone does not have an adverse effect on mineral absorption, but when oxalic acid, found in some green leafy vegetables, is added to a diet including sources of fiber, mineral availability is significantly affected. These findings contribute to a more complete understanding of interactions among nutrients and other dietary components, and aid in evaluating and establishing dietary standards for mineral consumption.

Dietary Fat and High Blood Pressure: A series of studies investigated the effects of dietary fats on blood pressure. Decreasing the total fat content of the test diets, as well as increasing the ratio of polyunsaturated to saturated fat, significantly lowered blood pressure. Hypertension is known to be a major risk factor in coronary heart disease and strokes, but until now there has been little evidence that any dietary factor other than sodium plays a role in high blood pressure. A better understanding of the dietary factors contributing to high blood pressure has the potential for reducing morbidity and mortality from heart disease and strokes. Reducing the rates of these foremost causes of death and disability in our country also has implications for significant savings in our national medical care costs.

Stable Isotope Laboratory Established: A new laboratory has been established to use stable isotopes to study human nutrition problems. Ethical considerations have precluded the use of radioactive isotopes to study nutrient metabolism in humans. Unlike radioactive isotopes, stable isotopes give off no radiation, yet are equally valuable and sensitive when used to study nutrient absorption, retention, and excretion.

FOOD...A New Publication Series: With the publication of FOOD, USDA inaugurated a new series of nutrition information and guidance booklets. This magazine-style series combines full-color photography and a lively, readable text to give consumers reliable and up-to-date information on a range of food and nutrition topics. Almost two million copies of FOOD I have been distributed, and FOOD II will soon be published.

Nutrition Education Research: A series of five two-day workshops in nutrition education research were conducted to establish priorities for Human Nutrition's new Nutrition Education Research program. More than 100 nationally known experts in behavioral sciences, educational and evaluation research, and nutrition education participated. Proceedings will appraise the status of nutrition education research and the methodological and conceptual problems limiting work in this field, and will identify fruitful areas for future research.

CONTINGENCY RESEARCH FUND

The Contingency Research Fund, established by Congress in fiscal year 1962, is designed to provide a ready source of funds to meet unforeseen and immediate research needs. Releases from the fund are generally made in situations where an emergency exists, or for special needs such as an unexpected scientific "breakthrough," or for new diseases or pest problems where it appears inadvisable to wait for consideration of a request for funds for the project in the regular budget process. In allocating funds, the procedure is to make no commitments for allocations from the fund beyond the current year.

<u>Animal Production Efficiency Research:</u>	<u>1980 Obligations</u>
Purchase of small animal cages to meet Federal requirements....	\$ 35,000
Initiate tick research in Puerto Rico.....	30,000
Steamlines/Fargo, N. Dakota.....	18,000
Emergency feed purchase as a result of severe range drought in Eastern Montana.....	126,500
Importation of sheep from Canada to the U.S. under a Memorandum of Understanding between Canada and the USDA relative to "Evaluation of Breeds of Livestock both Exotic and Domestic".....	50,000
Energy saving perchloric acid fume hood.....	24,000
<u>Crop Production Efficiency Research:</u>	
Replacement of equipment and erection of temporary greenhouses destroyed by fire at Stillwater, Oklahoma.....	36,000
Inhibition of chitin synthesis in insects.....	80,000
Emergency identification of exotic mite pests on honey bees...	19,000
Repair hail-damaged roof at the Crops Laboratory in Fort Collins, Colorado.....	1,000
Replacement of bee research equipment and supplies lost in flooding at Baton Rouge, Louisiana.....	10,000
Reactivate fermentation recovery phase of research program by replacement of explosion-prone centrifuge.....	8,000
Partial cost of peptic synthesizer for preparing analogs of insect brain hormones.....	15,000
Genetic analysis of heliothis mitochondrial, DNA.....	48,500
<u>Processing, Storage, Distribution Efficiency Research:</u>	
Emergency repairs to the refrigerated storage facility at WRRC, Albany, California.....	53,000
Research on trypsin inhibitors on soybean and other vegetable products.....	116,000

<u>Research to Improve Human Health and Safety:</u>	<u>1980 Obligations</u>
Treating food waste by fermentation process to destroy harmful organisms.....	\$ 65,000
Origin of Clostridium botulinum spores in honey.....	20,000
Specialty chemicals for fire ant control.....	45,000
 <u>Research on Conservation and Watershed:</u>	
Laboratory and headhouse/greenhouse equipment at Watkinsville, Georgia.....	100,000
Automated system for rearing Mediterranean Fruit Fly.....	<u>100,000</u>
Total, 1980 obligations, Contingency Research Fund.....	1,000,000
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STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1980		Estimated 1981		Estimated 1982	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
ALABAMA, Auburn.....	2,019,762	54	2,170,600	53	2,258,700	53
ALASKA, Palmer.....	536,506	8	539,500	9	821,700	9
ARIZONA						
Phoenix.....	3,291,282	105	4,132,400	110	4,431,600	110
Tucson.....	3,133,086	83	2,987,700	77	3,305,200	77
Total.....	6,424,368	188	7,120,100	187	7,736,800	187
ARKANSAS						
Booneville.....	676,784	2	949,500	6	949,500	6
Stuttgart.....	153,360	3	207,700	3	215,000	3
Total.....	830,144	5	1,157,200	9	1,164,500	9
CALIFORNIA						
Albany.....	17,592,695	354	19,573,300	440	19,720,100	440
Brawley.....	539,558	20	--	--	--	--
Davis.....	1,353,198	15	1,292,300	19	1,443,400	19
Fresno.....	2,307,789	69	2,453,200	73	2,770,500	73
Indio.....	287,744	10	208,900	7	224,600	7
Pasadena.....	745,344	17	944,500	19	1,085,700	19
Riverside.....	2,029,290	55	2,325,900	66	2,502,400	66
Salinas.....	1,501,541	35	1,292,300	38	1,347,500	38
San Francisco.....	972,447	4	1,738,600	11	1,816,600	11
Shafter.....	784,452	19	1,061,500	25	1,093,600	25
Total.....	28,114,058	598	30,890,500	698	32,004,400	698
COLORADO						
Akron.....	463,443	10	451,000	10	470,600	10
Denver.....	1,448,951	40	1,637,800	40	1,973,600	40
Fort Collins.....	4,081,527	95	4,364,200	106	4,579,200	106
Total.....	5,993,921	145	6,453,000	156	7,023,400	156
DISTRICT OF COLUMBIA						
Program Headquarters	2,223,437	79	2,387,600	81	2,823,400	81
Agency Management Services.....	18,685,078	499	27,245,900	550	30,987,300	552
Centrally Financed Program.....	9,890,321	8	12,710,000	8	13,290,700	8
Subtotal....	28,575,399	507	39,955,900	558	44,278,000	560
Total....	30,798,836	586	42,343,500	639	47,101,400	641
DELAWARE						
Georgetown.....	321,866	9	299,200	9	312,300	9
Newark.....	386,777	14	399,400	14	419,100	14
Total....	708,643	23	698,600	23	731,400	23

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1980		Estimated 1981		Estimated 1982	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
FLORIDA						
Belle Glade.....	296,379	6	182,400	7	195,600	7
Bradenton.....	9,816	--	--	--	--	--
Brooksville.....	212,402	3	220,000	4	229,800	4
Canal Point.....	547,023	22	740,400	27	773,400	27
Fort Lauderdale.....	273,574	5	509,400	7	526,200	7
Gainesville.....	5,972,044	136	6,487,400	146	7,237,400	146
Lake Alfred.....	107,674	3	124,900	3	130,500	3
Miami.....	854,845	28	711,000	23	838,100	23
Orlando.....	2,216,129	69	2,380,500	70	2,484,100	70
Winter Haven.....	629,576	18	677,600	20	750,300	20
Total....	11,119,462	290	12,033,600	307	13,165,400	307
GEORGIA						
Athens.....	6,875,514	220	7,573,800	248	8,207,500	248
Byron.....	1,616,325	49	1,594,700	44	1,662,100	44
Dawson.....	866,565	22	741,000	22	942,600	22
Experiment.....	309,316	7	375,400	8	437,800	8
Savannah.....	1,824,408	59	2,045,700	63	2,136,000	63
Tifton.....	4,864,657	102	5,926,800	128	6,208,400	128
Watkinsville.....	1,434,427	35	1,219,300	34	1,449,100	34
Total....	17,791,212	494	19,476,700	547	21,043,500	547
HAWAII						
Hilo.....	663,026	14	--	--	--	--
Honolulu.....	1,125,598	31	1,699,200	49	2,082,400	49
Total....	1,788,624	45	1,699,200	49	2,082,400	49
IDAHO						
Aberdeen.....	318,543	8	328,400	8	343,000	8
Boise.....	658,239	17	751,000	19	911,300	19
Dubois.....	905,759	15	1,017,900	17	1,064,200	17
Kimberly (Twin Falls).....	1,525,550	48	1,787,000	53	1,922,600	53
Total....	3,408,091	88	3,884,300	97	4,241,100	97
ILLINOIS						
Chicago.....	111,514	3	150,100	4	157,000	4
Peoria.....	17,036,475	419	20,033,700	437	19,531,000	437
Urbana.....	2,193,573	46	2,471,600	49	2,665,700	49
Total....	19,341,562	468	22,655,400	490	22,353,700	490
INDIANA						
Lafayette.....	1,949,695	33	2,189,900	32	2,620,200	32
Vincennes.....	504,588	9	297,700	11	310,000	11
Total....	2,454,283	42	2,487,600	43	2,930,200	43

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1980		Estimated 1981		Estimated 1982	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
IOWA						
Ames.....	11,474,455	309	11,748,900	313	12,667,200	313
Ankeny.....	343,798	9	385,600	9	402,500	9
Total.....	11,818,253	318	12,134,500	322	13,069,700	322
KANSAS, Manhattan.....	2,769,300	70	2,998,900	70	3,258,000	70
KENTUCKY, Lexington....	754,917	21	836,100	23	419,800	15
LOUISIANA						
Baton Rouge.....	1,142,447	35	1,033,600	23	1,092,400	23
Crowley.....	128,293	4	159,000	4	165,100	4
Houma.....	1,203,954	29	951,400	30	995,200	30
Jeanerette.....	21,037	1	21,700	1	22,700	1
Lake Charles.....	297,223	7	324,700	7	340,200	7
New Orleans.....	19,481,430	407	22,947,300	436	23,858,300	444
Total.....	22,274,384	483	25,437,700	501	26,473,900	509
MAINE, Orono.....	390,427	10	423,800	10	437,800	10
MARYLAND						
Beltsville.....	59,067,322	1,540	62,158,700	1,424	69,072,900	1,424
Frederick.....	1,599,517	40	1,819,400	41	2,047,900	41
Glenn Dale.....	299,049	10	315,300	11	329,000	11
Hyattsville.....	5,171,896	97	7,150,500	92	7,498,800	92
Total.....	66,137,784	1,687	71,443,900	1,568	78,948,600	1,568
MASSACHUSETTS						
Boston.....	2,615,215	0	3,193,000	3	3,337,600	3
Otis AFB.....	222,605	3	193,600	3	202,700	3
Total.....	2,837,820	3	3,386,600	6	3,540,300	6
MICHIGAN, East Lansing	2,569,497	66	2,551,200	68	2,731,200	68
MINNESOTA						
East Grand Forks....	319,538	9	334,200	9	349,100	9
Minneapolis.....	156,872	4	163,700	4	257,500	4
Morris.....	1,084,109	30	1,085,800	32	1,224,600	32
St. Paul.....	1,666,552	35	1,924,400	41	2,181,400	41
Total.....	3,227,071	78	3,508,100	86	4,012,600	86
MISSISSIPPI						
Gulfport.....	237,723	8	263,300	8	275,300	8
Meridian.....	379,857	11	363,100	11	378,700	11
Oxford.....	1,910,217	55	1,999,500	54	2,690,000	54
Poplarville.....	193,528	4	220,200	5	225,200	5
Mississippi State...	3,741,869	90	4,156,700	99	4,451,100	99
Stoneville.....	5,417,858	183	5,517,000	163	5,935,800	163
Total.....	11,881,052	351	12,519,800	340	13,956,100	340

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1980		Estimated 1981		Estimated 1982	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
MISSOURI, Columbia...	3,212,362	86	3,458,700	87	3,771,600	87
MONTANA						
Bozeman.....	577,543	16	699,700	18	947,500	18
Miles City.....	1,172,282	10	1,034,500	11	1,079,100	11
Sidney.....	763,939	24	812,200	27	1,022,100	27
Total....	2,513,764	50	2,546,400	56	3,048,700	56
NEBRASKA						
Clay Center.....	5,440,837	51	6,153,400	59	6,890,000	59
Lincoln.....	1,982,175	35	2,001,200	35	2,306,500	35
Total....	7,423,012	86	8,154,600	94	9,196,500	94
NEVADA, Reno.....	600,247	13	664,400	15	777,200	15
NEW JERSEY						
New Brunswick.....	321,111	7	191,900	5	295,400	5
NEW MEXICO						
Las Cruces.....	1,014,379	30	979,800	34	1,023,300	34
NEW YORK						
Geneva.....	183,044	5	186,600	5	238,000	5
Ithaca.....	2,234,006	38	2,241,700	40	2,674,900	40
Plum Island.....	10,698,384	337	10,641,600	337	11,388,500	337
Total....	13,115,434	380	13,069,900	382	14,301,400	382
NORTH CAROLINA						
Oxford.....	1,247,074	38	1,353,400	42	1,327,900	42
Raleigh.....	2,909,219	53	3,014,500	63	3,416,700	63
Total....	4,156,293	91	4,367,900	105	4,744,600	105
NORTH DAKOTA						
Fargo.....	4,885,659	120	5,316,600	123	5,962,200	123
Grand Forks.....	2,936,571	30	2,393,800	35	2,498,600	35
Mandan.....	1,895,909	50	1,751,200	50	1,958,100	50
Total....	9,718,139	200	9,461,600	208	10,418,900	208
OHIO						
Columbus.....	134,863	4	183,200	5	191,500	5
Coshocton.....	548,466	12	664,600	15	694,700	15
Delaware.....	421,601	12	577,700	13	602,400	13
Wooster.....	1,215,439	39	1,246,900	39	1,301,900	39
Total....	2,320,369	67	2,672,400	72	2,790,500	72
OKLAHOMA						
Durant.....	1,371,248	47	1,650,600	45	1,764,500	45
El Reno.....	834,733	13	1,270,700	12	1,304,600	12
Stillwater.....	1,060,851	23	1,027,500	22	1,073,100	22
Woodward.....	800,093	15	472,800	15	493,800	15
Total....	4,066,925	98	4,421,600	94	4,636,000	94

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1980		Estimated 1981		Estimated 1982	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
OREGON						
Burns.....	95,614	1	214,400	1	224,100	1
Corvallis.....	1,844,426	43	1,816,900	43	2,055,900	43
Pendleton.....	715,326	21	736,600	20	941,300	20
Total.....	2,655,366	65	2,767,900	64	3,221,300	64
PENNSYLVANIA						
University Park....	2,094,587	49	2,213,500	49	2,392,200	49
Wyndmoor.....	10,200,078	291	11,519,000	322	12,963,000	322
Total.....	12,294,665	340	13,732,500	371	15,355,200	371
SOUTH CAROLINA						
Charleston.....	1,247,788	40	1,336,300	40	1,428,400	40
Clemson.....	1,180,819	36	2,150,100	36	2,206,700	36
Florence.....	1,355,651	35	1,358,500	35	1,417,500	35
Total.....	3,784,258	111	4,844,900	111	5,052,600	111
SOUTH DAKOTA						
Brookings-Madison...	1,300,234	35	1,270,000	35	1,328,200	35
TENNESSEE						
Greenville.....	110,484	3	148,600	3	--	--
Jackson.....	136,964	4	116,000	4	121,100	4
Knoxville.....	790,628	24	469,000	13	492,500	13
Lewisburg.....	114,468	4	124,200	4	129,400	4
Total.....	1,152,544	35	857,800	24	743,000	21
TEXAS						
Beaumont.....	403,052	14	451,200	14	471,000	14
Brownsville.....	1,158,508	32	1,185,100	33	1,237,000	33
Brownwood.....	360,666	14	387,600	14	404,800	14
Bushland.....	1,599,656	36	1,792,900	36	2,043,500	36
College Station.....	5,171,282	153	5,710,900	141	6,327,400	143
Houston.....	2,011,179	--	2,683,000	2	2,848,100	2
Kerrville.....	1,953,995	64	2,261,100	56	2,766,700	57
Lubbock.....	985,026	28	1,234,900	27	1,329,100	27
Mission.....	742,814	20	866,200	20	1,161,700	21
Temple.....	1,726,764	37	1,929,700	38	2,489,700	40
Weslaco.....	3,567,329	102	3,741,900	104	4,011,100	104
Total.....	19,680,271	500	22,244,500	485	25,090,100	491
UTAH, Logan.....	2,141,600	56	2,231,700	60	2,508,300	60

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1980		Estimated 1981		Estimated 1982	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
VIRGINIA						
Blacksburg.....	63,660	2	67,700	2	70,800	2
Richmond.....	159,163	4	151,100	5	--	--
Suffolk (Holland) ..	360,084	12	404,500	13	422,200	13
Total....	582,907	18	623,300	20	493,000	15
WASHINGTON						
Prosser.....	1,397,955	41	1,576,700	40	1,554,500	40
Pullman.....	2,165,636	62	3,158,800	67	2,958,800	67
Wenatchee,.....	1,105,599	24	987,700	20	942,800	20
Yakima.....	1,614,561	45	1,574,600	41	1,637,700	41
Total....	6,283,751	172	7,297,800	168	7,093,800	168
WEST VIRGINIA						
Beckley.....	--	--	873,300	16	902,000	16
Kearneysville.....	1,234,864	20	1,901,700	23	1,958,500	23
Morgantown.....	658,333	14	--	--	--	--
Total....	1,893,197	34	2,775,000	39	2,860,500	39
WISCONSIN, Madison...						
	2,325,700	38	3,473,200	44	4,145,600	44
WYOMING						
Cheyenne.....	623,153	19	729,700	25	760,600	25
Laramie.....	426,218	11	300,300	10	315,800	10
Total....	1,049,371	30	1,030,000	35	1,076,400	35
PUERTO RICO						
Mayaguez.....	681,923	31	972,300	42	1,011,900	42
Rio Piedras.....	323,919	8	345,000	8	360,200	8
Total....	1,005,842	39	1,317,300	50	1,372,100	50
VIRGIN ISLANDS						
St. Croix.....	450,424	13	301,700	11	316,800	11
OTHER COUNTRIES						
Argentina.....	161,625	--	88,300	1	91,900	1
France, Paris.....	488,909	2	368,100	2	385,900	2
Italy, Rome.....	362,789	2	231,400	2	242,100	2
Japan.....	60,870	--	84,200	1	87,300	1
Kenya.....	121,704	1	112,200	1	117,400	1
Netherlands, Rotherdam.....	359,555	2	280,100	2	292,300	2
Thailand.....	67,144	2	82,000	2	85,400	2
Total....	1,622,596	9	1,246,300	11	1,302,300	11

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1980		Estimated 1981		Estimated 1982	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
Program locations to be determined.....	--	--	3,490,500	--	5,305,100	--
Contingency Research Fund.....	-- <u>a/</u>	--	1,000,000	--	1,000,000	--
Construction of Facilities.....	3,900,000	--	12,100,000	--	1,900,000	--
Repair & Maintenance of Facilities and Equipment.....	-- <u>b/</u>	--	10,716,000	--	11,716,000	--
Unobligated Balance..	<u>5,729,270</u>	--	--	--	--	--
Subtotal, Available or Estimate.....	372,304,008	8724	432,160,000	8981	458,391,000	8981
Allotment to: Forest Service.....	291,992	1	389,000	2	390,000	2
Total, Available or Estimated.....	372,596,000c/	8725	432,549,000	8983	458,781,000	8983

a/ Obligations for the \$1,000,000 appropriated in 1980 are included in the locations above.

b/ Obligations for repair and maintenance in 1980 are included in the locations above.

c/ Excludes transfer of \$995,000 to OICD and rescission of \$1,732,000 for furniture procurement. Includes \$2,000,000 for Special Fund.

SCIENCE AND EDUCATION ADMINISTRATION
COOPERATIVE RESEARCH

Purpose Statement

Cooperative Research participates in a nationwide system of agricultural research program planning and coordination between the States and the U.S. Department of Agriculture which encourages and assists in the establishment and maintenance of cooperation within and among the States and between the States and their Federal research partners. The primary function is the administration of Acts of Congress that authorize Federal appropriations for agricultural research carried on by the State agricultural experiment stations of the 50 States, Puerto Rico, Guam, the Virgin Islands, and the District of Columbia; by approved schools of forestry; the 1890 land-grant institutions and Tuskegee Institute; colleges of veterinary medicine; and other eligible institutions.

Administration of payments and grants involves the approval in advance of each individual research proposal submitted by a State agricultural experiment station or other institution to be financed in whole or in part from Federal grant funds and the disbursement of funds. The research programs and expenditures are continuously reviewed and evaluated.

The program coordination and planning is carried out by a Cooperative Research staff located entirely in Washington, D. C. As of September 30, 1980, there were 90 full-time permanent employees and 11 other than permanent employees.

SCIENCE AND EDUCATION ADMINISTRATION

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

Cooperative Research

For payments to agricultural experiment stations, for cooperative forestry and other research, for facilities, and for other expenses, including [\$128,615,000] \$146,609,000 to carry into effect the provisions of the Hatch Act, approved March 2, 1887, as amended by the Act approved August 11, 1955 (7 U.S.C. 361a-361i), and further amended by Public Law 92-318 approved June 23, 1972, and further amended by Public Law 93-471 approved October 26, 1974, including administration by the United States Department of Agriculture, and penalty mail costs of agricultural experiment stations under section 6 of the Hatch Act of 1887, as amended; [\$10,774,000] \$12,281,000 for grants for cooperative forestry research under the Act approved October 10, 1962 (16 U.S.C. 582a--582a-7), as amended by Public Law 92-318 approved June 23, 1972, including administrative expenses; [\$19,270,000] \$21,992,000 for payments to the 1890 land-grant colleges, including Tuskegee Institute, for research under section 1445 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (Public Law 95-113), as amended, including administration by the United States Department of Agriculture, and penalty mail costs of the 1890 land-grant colleges, including Tuskegee Institute; [\$17,076,000] \$48,515,000 for contracts and grants for agricultural research under the Act of August 4, 1965, as amended (7 U.S.C. 4501)[; \$16,000,000], of which \$19,515,000 is for special research grants, and \$29,000,000 is for competitive research grants, including administrative expenses;

1 [\$6,500,000 for the support of animal health and disease programs authorized by section 1433 of Public Law 95-113, including administrative expenses; \$500,000] \$540,000 for grants in accordance with section 1419 of Public Law 95-113, as amended; [\$650,000] \$702,000 for research authorized by the Native Latex Commercialization and Economic Development Act of 1978; and [\$1,512,000] \$1,837,000 for necessary expenses of Cooperative Research activities, including administration of payments to State agricultural experiment stations, funds for employment pursuant to the second sentence of section 706(a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed \$50,000 for employment under 5 U.S.C. 3109; in all, [\$200,897,000] \$232,476,000.

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The first change corrects the language to include competitive research grants under the authorizing legislation of the Act of August 4, 1965, Public Law 89-106.

The second change is for the purpose of deleting language which provides for animal health and disease programs authorized by section 1433 of Public Law 95-113. No funding is proposed for this program in fiscal year 1982.

The third change would clarify that section 1419 of Public Law 95-113 has been amended by section 252 of Public Law 96-294, Energy Security Act of 1980.

COOPERATIVE RESEARCH

Appropriation Act, 1981	\$200,897,000
Budget Estimate, 1982	232,476,000
Increase in Appropriation	<u>+31,579,000</u>

Adjustments in 1981:

Appropriation Act, 1981.....	\$200,897,000
1981 Supplemental Appropriation for pay costs.....	<u>+186,000</u>
Adjusted base for 1982.....	201,083,000
Budget estimate, 1982.....	232,476,000
Increase over adjusted 1981.....	<u>+31,393,000</u>

SUMMARY OF INCREASES AND DECREASES
(on basis of adjusted appropriation)

<u>Item of Change</u>	<u>1981 Estimated</u>	<u>Program Changes</u>	<u>1982 Estimated</u>
Payments under the Hatch Act	\$128,615,000	+17,994,000	\$146,609,000
Cooperative forestry research	10,774,000	+1,507,000	12,281,000
Payments to 1890 colleges and Tuskegee Institute	19,270,000	+2,722,000	21,992,000
Special research grants	18,226,000	+2,531,000	20,757,000
Competitive research grants	16,000,000	+13,000,000	29,000,000
Animal health and disease research.	6,500,000	-6,500,000	---
Federal administration (direct appropriation)	<u>1,698,000</u>	<u>+139,000</u>	<u>1,837,000</u>
TOTAL AVAILABLE	<u>201,083,000</u>	<u>+31,393,000</u>	a/b/ <u>232,476,000</u>

- a/ Includes a total increase of \$18,107,000 toward increased operating costs in order to sustain performance levels for continuing programs. Includes a total increase of \$204,000 for the portion of pay increases effective in FY 1981 and necessary to carry out the program proposed in FY 1982.
- b/ The budget provides an overall increase of 15.6% for cooperative research. Within this amount, basic research will have real growth of 11.6% based on the Administration's December 1980 economic assumptions which estimate a rate of inflation in FY 1982 of 9.7%. For the formula grant programs, changes in the estimated rate of inflation for FY 1982 will cause an offsetting shift between the amount of the request to be used for increased operating costs and the amount to be used for expansion of research programs.

PROJECT STATEMENT
(On basis of adjusted appropriation)

Project	1980		1981 (estimated)			1982 (estimated)		
	Amount	Staff Years	Amount	Staff Years	Increase or Decrease	Amount	Staff Years	
1. Payments under the Hatch Act:								
a. Research program:								
Formula funds ..	\$87,101,863		\$95,153,628		+\$12,955,680	\$108,109,308		
Regional research:	26,839,629		29,370,813		+4,498,500	33,869,313		
Subtotal	113,941,492		124,524,441		+17,454,180	141,978,621		
b. Penalty Mail	509,051		476,000		- -	476,000		
c. Federal administration (3%) ...	3,271,870		3,614,559		+539,820	4,154,379		
Total, Hatch Act ...	117,722,413	51	128,615,000	62	+17,994,000(1)	146,609,000	62	
2. Cooperative forestry research 1/	10,000,000	6	10,774,000	6	+1,507,000(2)	12,281,000	6	
3. Payments to 1890 colleges and Tuskegee Institute 1/	16,802,411	8	19,270,000	8	+2,722,000(3)	21,992,000	8	
4. Special research grants:								
Soil erosion in Pacific Northwest.	450,000		600,000		+48,000	648,000		
Dried bean research in North Dakota ..	25,000		25,000		-25,000	- -		
Food and agriculture policies	150,000		150,000		+12,000	162,000		
Soybean research ..	500,000		500,000		+40,000	540,000		
Integ. pest management (consortium).	--		1,500,000		+1,720,000	3,220,000		
Biological control of pests.....	--		--		+500,000	500,000		
Pesticide clearance	1,000,000		1,250,000		+250,000	1,500,000		
Pesticide impact assessment	1,810,000		1,810,000		+345,000	2,155,000		
Rural development centers	300,000		300,000		+24,000	324,000		
Soybean cyst nematode research in Missouri.....	250,000		250,000		-250,000	- -		
Bean and beet research in Michigan	50,000		75,000		-75,000	- -		
Mushroom byproduct utilization research-Pennsylvania:	38,000		38,000		-38,000	- -		
Animal health research	7,000,000		5,050,000		+404,000	5,454,000		
Energy research ...	1,900,000		1,900,000		+152,000	2,052,000		
Aquaculture research at Stoneville, Mississippi	150,000		150,000		-150,000	- -		
Dairy photoperiod research-Michigan.	35,000		35,000		-35,000	- -		
Soil and water conservation-Alaska .	290,000		290,000		-290,000	- -		
Bean flour research-Texas & Michigan .	100,000		103,000		-103,000	- -		
Aquaculture research:	--		500,000		+40,000	540,000		
Antidesertification research	--		1,000,000		+80,000	1,080,000		
Genoplasm resources	--		500,000		+440,000	940,000		
Peach tree short life research,								
South Carolina.....	--		100,000		-100,000	- -		
Blueberry shoestring virus , Michigan..	--		100,000		-100,000	- -		
Food quality and safety research... .	--		--		+400,000	400,000		

Project	1980		1981 (estimated)			1982 (estimated)			
	Amount	Years	Staff	Amount	Years	Increase or Decrease	Amount	Years	Staff
Mount St. Helens research:	--			\$850,000		-\$850,000	--		
Ash effects on ag. and hort. crops. .	--			(400,000)		(-400,000)	--		
Ash effects on soil complexes .	--			(200,000)		(-200,000)	--		
Ash effects on water quality ..	--			(100,000)		(-100,000)	--		
Ash effects on animals	--			(150,000)		(-150,000)	--		
Subtotal, Special research grants .	\$14,048,000:			17,076,000		+2,439,000(4)	19,515,000		
Alcohol fuels research (Section 1419, PL 95-113) .	500,000:			500,000		+40,000(5)	540,000		
Native Latex Act (PL 95-592)	650,000:			650,000		+52,000(6)	702,000		
Total 1/	15,198,000:	11		18,226,000	11	+2,531,000	20,757,000	11	
5. Competitive research grants:									
Plant science.....	12,600,000:			13,000,000		+9,700,000	22,700,000		
Human nutrition ...	2,900,000:			3,000,000		+3,300,000	6,300,000	--	
Total, Competitive research grants 1/:	15,500,000:	12		16,000,000	12	+13,000,000(7)	29,000,000	14	
6. Rural development research 2/	1,500,000:	1	--	--	--	--	--	--	
7. Animal health and disease research 2/.	6,000,000:	2		6,500,000	2	-6,500,000(8)	--	--	
8. Federal administration (direct appro.)	1,482,000:	4		1,698,000	4	+139,000(9)	1,837,000	4	
Unobligated balance ..	1,826,176:	--		--	--	--	--	--	
Total available or estimate	186,031,000:	95		201,083,000	105	+31,393,000	232,476,000	105	
Proposed Supplemental for pay increase costs:	--	--		-186,000	--	--	--	--	
Total, appropriation...:186,031,000: 95 :200,897,000 : 105 :									

1/ Includes 3% set-aside for Federal administration.

2/ Includes 4% set-aside for Federal administration.

EXPLANATION OF PROGRAM

The Agriculture, Rural Development, and Related Agencies Appropriations Act of 1981, funds Cooperative Research activities authorized under the following acts:

1. Payments to agricultural experiment stations under the Hatch Act, and for penalty mail - Agricultural Experiment Stations Act of August 11, 1955, Hatch Act of 1887 as amended - 7 U.S.C. 361a-361i; Education Amendments of 1972, Public Law 92-318, June 23, 1972; Public Law 93-471, October 26, 1974; and Public Law 95-113, September 29, 1977, as amended.

The Act of August 11, 1955, as amended, provides that the distribution of Federal payments to States for fiscal year 1955 shall become a fixed base and that any sums appropriated in excess of the 1955 level shall be distributed in the following manner:

- 20% shall be allotted equally to each State.
- not less than 52% shall be allotted to the States as follows:
 - one-half in an amount proportionate to the relative rural population of each State to the total rural population of all States, and
 - one-half in an amount proportionate to the relative farm population of each State to the total farm population of all States.
- not more than 25% shall be allotted to the States for cooperative research in which two or more State agricultural experiment stations are cooperating to solve problems that concern the agriculture of more than one State.
- 3% shall be available to the Secretary of Agriculture for the administration of this Act.

The Act also provides that any amount in excess of \$90,000 available for allotment to any State, exclusive of the regional research fund, shall be matched by the State out of its own funds for research, and for the establishment and maintenance of facilities necessary for the performance of such research.

The Hatch Act provides for the mailing under penalty indicia by agricultural experiment stations of bulletins, reports, periodicals, reprints of articles, and other publications, including lists of publications necessary for dissemination of results of research. Mailings include not only those to individual farmers upon request but also to newspapers, libraries, other experiment stations, and organizations interested in results of research and dissemination of such results. Under Title 39 U.S.C. 3206(b) and 3203(a)(4), the Department paid to the U.S. Postal Service \$509,051 to cover postage of mail sent under the penalty privilege by the State agricultural experiment stations during fiscal year 1980. Funds of \$476,000 have been set-aside from the fiscal year 1981 appropriation under the Hatch Act for payments to the U.S. Postal Service.

Three percent of funds appropriated under the Hatch Act is set-aside for Federal administration. Administration includes disbursement of funds and a continuous review and evaluation of the research programs of the State agricultural experiment stations supported wholly or in part from Hatch funds. Cooperative Research encourages and assists in the establishment of cooperation within and between the States, and also actively participates in the planning and coordination of research programs between the States and the Department at the regional and national level.

2. Cooperative Forestry Research - The Cooperative Forestry Research Act of October 10, 1962, 16 U.S.C. 582a-7; Education Amendments of 1972, Public Law 92-318, June 23, 1972.

The Act authorizes funding of research in State institutions certified by a State representative designated by the governor of each State. The Act provides that appropriated funds be apportioned among States as determined by the Secretary after consultation with a national advisory board of not less than seven officials of the forestry schools of the State-certified eligible colleges and universities chosen by a majority of those schools. Determination of apportionments follows consideration of pertinent factors including, but not limited to, areas of non-Federal commercial forest land and volume of timber cut from growing stock. The Act also limits the payments to the amount made available and budgeted from non-Federal sources by the certified institutions for expenditure for forestry research. Three percent of funds appropriated under this Act is set-aside for Federal administration.

3. Payments to 1890 Colleges and Tuskegee Institute - The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1445, Public Law 95-113, September 29, 1977; Public Law 95-547, October 28, 1978.

Public Law 95-113, as amended, provides for support of continuing agricultural research at colleges eligible to receive funds under the Act of August 30, 1890, including Tuskegee Institute. Beginning with fiscal year 1979, there shall be appropriated funds for each fiscal year, an amount not less than 15% of the total for such year under Section 3 of the Act of March 2, 1887. These funds shall be distributed as follows:

-3% shall be available to the Secretary of Agriculture.
-Payments to States in fiscal year 1978 is a fixed base. Of funds in excess of this amount:

20% shall be allotted equally to each State.

40% shall be allotted in an amount proportionate to the rural population of the State in which the eligible institution is located to the total rural population of all the States in which eligible institutions are located, and

40% shall be allotted in an amount proportionate to the farm population of the State in which the eligible institution is located to the total farm population of all the States in which eligible institutions are located.

Allotments to Tuskegee Institute and Alabama A&M University shall be determined as if each institution were in a separate State. Three percent of the funds appropriated under this Act is set aside for Federal administration. This includes disbursements of funds and review and evaluation of proposals.

4. Special Research Grants - Section 2(c), Act of August 4, 1965, 7 U.S.C. 450i as amended by Public Law 95-113, September 29, 1977, and Public Law 96-294, June 30, 1980; Public Law 95-592.

Section 2 of the Act of August 4, 1965, as amended, authorizes Special Research Grants for periods not to exceed five years to land-grant colleges and universities, State agricultural experiment stations, and to all colleges and universities having a demonstrable capacity in food and agricultural research to further the programs of the Department of Agriculture. Special Research Grants are awarded on the discretionary basis as well as using a competitive peer panel process in the selection of proposals to be funded. In fiscal year 1981, \$17,076,000 is appropriated for this program. In addition, \$500,000 is for Alcohol Fuels Research Grants in accordance with Section 1419 of Public Law 95-113, and \$650,000 is for research under the Native Latex Commercialization and Economic Development Act of 1978.

Research on food and agriculture policies, soybeans, pesticide clearance, soil erosion in the Pacific Northwest, pesticide impact assessment, energy, animal health, rural development centers, integrated pest management, aquaculture, antidesertification, and germplasm resources will receive emphasis in FY 1981. Research on alcohol fuels is also carried out in accordance with Section 1419 of Public Law 95-113, as amended by Public Law 96-294, June 30, 1980. Research will also be carried out under the Native Latex Commercialization and Economic Development Act of 1978.

5. Competitive Research Grants - Section 2(b), Act of August 4, 1965, 7 U.S.C. 450i as amended by Public Law 95-113, September 29, 1977.

Section 2 of the Act of August 4, 1965 as amended, authorizes Competitive Grants for periods not to exceed five years to State Agricultural Experiment Stations, all Colleges and Universities, other research institutions and

organizations, Federal agencies, private organizations or corporations and individuals to further the programs of the Department of Agriculture. By obtaining the participation of outstanding researchers in the entire U.S. scientific community, emphasis will be placed on basic research critical to food production and human nutrition including biological stress of plants, genetic mechanisms of plants, plant nitrogen fixation, plant photosynthesis and human nutrient requirements.

6. Rural Development Research - Title V, Rural Development Act of 1972, 7 U.S.C. 2661-2668; Public Law 94-259, April 5, 1976; Public Law 96-355, September 24, 1980.

In 1981 and 1982 rural development funds are provided and distributed under the Hatch Act, which is consistent with the intent of Congress in appropriating funds for fiscal year 1981.

The Rural Development Act of 1972, as amended, provided that funds were to be allocated as follows:

- 20% shall be allocated equally to each State.
- 66% shall be allocated to each State as follows:
 - one-half in an amount proportionate to the relative rural population of each State to the total rural population of all States, and
 - one-half in an amount proportionate to the relative rural population of each State to the total rural population of all States.
- 10% shall be allocated to the States for research serving two or more States in which universities in two or more States cooperate or which is conducted by one university to serve two or more States.
- 4% shall be available to the Secretary of Agriculture for Federal administration, national coordination, and program assistance to the States.

7. Animal Health and Disease Research - The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1433, Public Law 95-113, September 29, 1977.

Section 1433 provides for support of livestock and poultry disease research in colleges of veterinary medicine and in eligible State agricultural experiment stations. These funds shall be distributed as follows:

- 4% shall be retained by the Department of Agriculture for administration, program assistance to the eligible institutions, and program coordination.
- 48% shall be distributed in an amount proportionate to the value of and income to producers from domestic livestock and poultry in each State to the total value of and income to producers from domestic livestock and poultry in all the States.
- 48% shall be distributed in an amount proportionate to the animal health research capacity of the eligible institutions in each State to the total animal health research capacity in all the States.

8. Federal Administration (direct appropriation) - Authority for direct appropriations is provided in the annual Agriculture, Rural Development, and Related Agencies Appropriations Act. These funds are used to provide support services in connection with research planning and coordination of all programs administered by Cooperative Research.

JUSTIFICATION OF INCREASES AND DECREASES

- (1) An increase of \$17,994,000 under the formula provisions of the Hatch Act as follows: (\$128,615,000 available in 1981).

- (a) An increase of \$12,475,000 for increased operating costs.

Need for Change: Recent studies have shown that the effectiveness of research is enhanced by intimate knowledge of the characteristics of the production area, close interactions among the researchers and the research users, and adaptive research and verification at outlying field locations. Each of the State Agricultural Experiment Stations has developed research expertise to match the profile of its State's agriculture. Research conducted by State scientists has been equivalent to and cooperative with that performed by Federal researchers in contributing to the high level and efficiency of food and fiber production, while reducing environmental and food safety dangers. The cost per unit of research conducted by State Agricultural Experiment Stations continues to increase due to inflation. This increase results from increased costs of salaries and benefits, services, supplies, materials, and equipment.

Nature of Change: This increase in formula funding for the State Agricultural Experiment Stations provides for salary and non-salary operating cost increases.

- (b) An increase of \$3,427,000 for an expanded research program under the Hatch Act.

Need for Change: Increased funding for support of this research program is needed to expand state and local capability to address basic or applied research needs in the most effective manner.

Nature of Change: This increase would fund expanded program support for high priority basic and applied research needs identified for the State or region.

- (c) An increase of \$1,292,000 for integrated pest management research.

Need for Change: The objective of this research is to develop system approaches to managing pests built upon sound ecological principles to assure reliable long-term productivity of farms and forests, conserve energy, and preserve the environment from pollutants.

Recent developments in pest management system approaches have provided methodology to optimize interdisciplinary pest management and production practices for insects, bacteria, fungi, viruses, nematodes, weeds, snails, birds, rodents and other organisms. These approaches can largely overcome serious problems associated with current practices, including environmental pollution, pest resistance to pesticides and the development of biotypes of pests that can overcome the genes for resistance bred into crops and livestock. These problems are increasingly making crop and livestock protection more expensive and less stable. Current losses due to pests are more than 30 percent of potential yield before harvest and 10 percent loss after harvest amounting to \$30 billion annually. In addition, the current cost of pest control is \$10 billion annually and increasing due to inflation and the impact of regulations that are designed to protect human health and the environment.

Nature of Change: Research will be initiated after site-specific planning and priorities are developed in concert with State and Federal research, State extension, and resident instruction. Other Federal, State and private research and action agencies will join in the process on a specific need basis. The program is designed to systematically evaluate the numerous pest, production, economic and sociological factors that impinge upon an agricultural and forestry production system. The program will identify and quantify numerous interactions within the production system to guide the development of optimum pest management strategies. The focus of the planning activity will be in the four USDA/SAES regions and the research will be undertaken in the participatory States working on coordinated plans. SEA-Cooperative Research will fund experiment station research developed in the regional planning activity in concert with SEA-Agricultural Research. This funding will increase support of the base IPM program which is augmented by the special grant program, contracts and other granting organizations. The SAES leadership working with SEA/AR have defined priority production systems that will receive first attention. These production systems include semiarid dryland and irrigated agroecosystems in the Western region; forages, fruits, vegetables, and urban environs in the Northeastern region; field crops, potatoes, vegetables, and urban environs in the Northcentral region; and soybean, vegetables, turf and ornamentals, peanuts, and livestock in the Southern region.

- (d) An increase of \$800,000 for acid precipitation research.

Need for Change: Acidity of atmospheric precipitation has been increasing in recent years and is the suspected cause of serious environmental damage in many parts of the world. Mountain lakes in New York have become devoid of fish partly because of acid precipitation. Adverse effects on crops and forests are suspected. The current USDA program centers around the National Atmospheric Deposition program, Hatch Regional Research Project NC-141, initiated in 1977 to study changes in atmospheric deposition (including acid precipitation) and its effects on agricultural systems. The initial effort has been a network of measurement sites to establish trends in the occurrence and degree of atmospheric deposition. The next step is to determine the effects of acid precipitation on agricultural systems. Funding through SEA/CR and SEA/AR is needed to direct studies to questions of primary concern to agriculture and to provide sound information for policy making in agriculture. An additional Hatch regional research project includes research to reduce the harmful effects of acid precipitation on agricultural productivity.

Nature of Change: Current research on the effects of acid precipitation is limited. Increased funding for coordinated SEA/CR and SEA/AR research directed towards developing a better understanding of the effects of acid precipitation will serve as a basis for efforts to ameliorate harmful effects. The funding increase would broaden and accelerate research on this problem. The primary thrust would be research on the effects of acid precipitation on agricultural systems. This would include effects on the growth and productivity of major crop plants, predisposition of plants to stress, and effects on the chemistry and biology of soils. There would also be increased support for the monitoring network on trends and spatial distribution of acid precipitation.

- (2) An increase of \$1,507,000 for Cooperative Forestry Research as follows:
(\$10,774,000 available in 1981).

- (a) An increase of \$1,045,000 for increased operating costs.

Need for Change: Increased costs of maintaining the current level of activity of the cooperative forestry research at the State Agricultural Experiment Stations and Schools of Forestry result from the annual rate of inflation. This results in the need for additional resources to fund increased costs of salaries and benefits, services, supplies, materials, equipment, and other operating costs.

Nature of Change: This increase provides for additional Federal funding of the Cooperative Forestry Research program to ameliorate the affect of inflation on program costs.

- (b) An increase of \$462,000 for an expanded cooperative forestry research program.

Need for Change: Increased funding for support of this forestry research program is needed to expand the State and local capability to address basic or applied research needs in the most effective manner.

Nature of Change: This increase would fund broad program support for high priority basic and applied research needs identified for the State or region.

- (3) An increase of \$2,722,000 for research at the Colleges of 1890 and Tuskegee Institute as follows: (\$19,270,000 available in 1981).

- (a) An increase of \$1,869,000 for increased operating costs.

Need for Change: Increased costs of maintaining the current level of activity of the 1890 Institutions and Tuskegee Institute result from the annual rate of inflation. This increase results from increased costs of salaries and benefits, services, supplies, materials, equipment, and other increased operating costs. The inflationary pressures of the economy have increased the cost per unit of research conducted. This increase will allow the research programs at the 1890 Institutions and Tuskegee Institute to continue at a level comparable to last year.

Nature of Change: This increase provides funds for increased salary and non-salary operating costs of the research programs of the 1890 institutions and Tuskegee Institute.

- (b) An increase of \$853,000 for an expanded research program.

Need for Change: Increased funding for support of this research program is needed to expand State and local capability to address basic or applied research needs in the most effective manner.

Nature of Change: This increase would fund expanded program support for high priority basic and applied research needs identified for the State or region.

- (4) A net increase of \$2,439,000 for Special Research Grants as follows:
(\$17,076,000 available in 1981).

- (a) An increase of \$1,205,000 for Special Research Grants for increased operating costs.

Need for Change: The Special Research Grant program is designed to provide accelerated solutions to high priority food and agricultural problems. Rising operating costs essential to this research have reduced the scope of accomplishments and effectiveness of this program. Program effectiveness under Special Research Grants is especially vulnerable to inflation because project budgets are planned and lump sum awards are made to cover research of several year's duration. This increase will make allowance for inflationary costs anticipated over the duration of Special Research Grant projects and permit high priority issues to be addressed at a level commensurate with the Nation's needs without sacrificing program effectiveness.

Nature of Change: Under the Special Research Grant program, colleges and universities with food and agricultural research capability are eligible for grants. Recipients are responsible for carrying out specific research assignments mutually agreed upon with the Department. This increase will provide offset for inflationary costs anticipated by these institutions in conducting research essential to Department programs.

- (b) An increase of \$1,600,000 for Special Research Grants for development of integrated pest management systems by a consortium of 15 State Agricultural Experiment Stations affiliated with land-grant universities. (\$1,500,000 was available in 1981.)

Need for Change: There is a need to develop integrated pest management systems useful for important crop groupings on a national basis. Reliance on a single tactic for pest control is no longer adequate for controlling pests to assure high quantity and quality farm produce. This 15 university consortium for the development of integrated pest management systems was initiated in FY 1980. The responsibility for funding the 15 university consortium on integrated pest management systems was jointly shared with the Environmental Protection Agency in FY 1981.

Nature of Change. Federal research fund support for the 15 university consortium on integrated pest management systems will now reside with the USDA. This program will continue the efforts of the 15 university consortium scientists to improve predictive models and develop advanced integrated systems for control of single or multiple pest complexes for alfalfa, apples, cotton and soybeans.

- (c) An increase of \$500,000 for Special Research Grants for biological control of pests (no funds available in 1981).

Need for Change: Biological control is a promising method of dealing with serious pest problems and is the cornerstone of IPM systems. This method has demonstrated outstanding accomplishments when adequate research has been focused on a problem. There are about 30 examples in the U.S. in which biological control has solved insect plant diseases and weed problems without the need for any supplemental control with pesticides or other methods. Payoff in biological control research has been shown to be thirty-fold in California where the State has

supported sizeable biological control research programs. This tactic shows great promise for improving the environment and agricultural productivity especially when interacted with host plant resistance. Action and regulatory agencies are increasingly aware of biological control components to offset environmental constraints placed on current chemical control practices.

Nature of Change: Research on biological control will be carried out through the special research grants program in support of the four regional IPM systems programs and the eight SAES/SEA-CR biological control regional projects. Research will be directed towards the development of improved biological control practices for insects, diseases, nematodes, weeds and other pests. Studies will include identification of new biological control agents and learning their genetic and physiological characteristics, development of biological control principles for the manipulation of pest populations, and distribution of biological control agents as part of overall management and production systems.

- (d) An increase of \$400,000 for Special Research Grants for food quality and safety research (no funds available in 1981).

Need for Change: The public is becoming increasingly concerned over the quality and safety of the food supply. In addition to the usual concerns for the effects of processing on nutritive value, bacteriological quality, wholesomeness and esthetic quality, concerns over safety relate to naturally occurring toxicants, inadvertant residues of toxic materials and food additives which may be potential health hazards. Regardless of whether the hazard is real or imagined, one result of the public concern is increased pressure on action and regulatory agencies to take regulatory action relative to public health issues. Frequently, sufficient information about the public health issue is not available for wise action. When this occurs, action and regulatory agencies place demands for needed scientific information upon the scientific community and its research programs. Finally, unnecessary regulation is restrictive to progress and the costs of regulation can be excessive.

While on-going research programs are addressing the problems of food safety, toxicology and quality, the effort is not large enough to provide timely answers. Expansion and strengthening of these vital research programs is needed. Research programs can play a major role in providing basic information useful in allaying undue public concern for the safety and wholesomeness of the food supply. These studies also respond to the needs of local, State and Federal regulatory and action agencies.

Nature of Change: Specific studies will be directed to determine the chemical, physical, microbiological and organoleptic properties of food, as well as the safety of agricultural products and commodities. Problems in the area of food toxicology will receive special emphasis. In recent years, nitrite has been shown to react with secondary amines (that exist naturally or can be formed from natural components in meats and other foods) to form potentially carcinogenic nitrosamines. Research will be directed toward finding out how nitrosamines are formed chemically and how they can be detected. Alternatives to the use of nitrite as an antclostridial agent will be sought. Other research will seek to determine the effects of pH, salt content heat, and muscle type on residual nitrite and flavor in cured meat.

- (e) An increase of \$150,000 for Special Research Grants for minor use pesticide clearance research (\$1,250,000 available in 1981).

Need for Change: A State/Federal partnership program for obtaining clearances for minor uses of pesticides has been underway for many years through a cooperative interregional project (IR-4). Increased resources are needed to provide research and liaison support for an increasing level of requests for pesticide registrations. New pest control technologies involving uses of pathogens, growth regulators, and pheromones have been developed that also need support for registration due to lack of economic incentives for the private sector. The IR-4 program provides the needed coordination of USDA, EPA, industry and the scientific community.

Nature of Change: The existing IR-4 program structure will be utilized to provide coordinators and research support to address the data needs of a backlog of some 600 pesticide registration requests; this backlog is increasing by approximately 200 per year. In addition, research protocols will be developed for specialty chemicals and beneficial organisms consonant with IPM system needs. Expanded research needs for environmental chemistry will be addressed via strengthened SAES programs or by cooperative agreements with other institutions. Resultant data from these programs will be used to support requests for tolerances, which will greatly facilitate registration of materials useful in IPM or conventional pest management systems.

- (f) An increase of \$400,000 for Special Research Grants for plant germplasm research (\$500,000 available in 1981).

Need for Change: Genetic variation, the basis for inherited improvement, is used by plant breeders to produce new desirable crop varieties and hybrids. In a report, Plant Genetic Resources: Conservation and Use, published by the National Plant Genetic Resources Board (NPGRB) in 1979, it was pointed out that many of our major crop plants rest on a very narrow genetic base, and consequently are highly vulnerable to attack by new forms of disease and insect pests. This was demonstrated very dramatically in 1969 and 1970, when up to 50 percent of the corn yield in some states, and 15 percent of the corn yield nationally, was reduced as a result of infestation by the southern corn leaf blight. Experiences with other diseases such as wheat stem rust, Dutch Elm disease, and others have shown that large acreages of genetically uniform varieties or hybrids may be extremely vulnerable to pests, abnormal weather patterns or other crop production difficulties. These sporadic production difficulties may create disasters since modern cropping practices require fields highly uniform for a number of plant characteristics.

Society needs to be concerned about the conservation of genetic variability of the economic species since people are dependent on these crops for food, fiber, and some industrial materials for survival, as well as for their natural beauty for an enhanced quality of life. Genetic variability is represented by wild and improved populations. Currently, much variation is being lost prior to collection because of modernization of cropping practices in foreign countries and other causes. With reduced variation, the potential genetic vulnerability increases and, thereby threatens future production of all major crop plants.

Nature of Change: Funds through Special Research Grants will partially support the National Plant Germplasm System (NPGS), a joint Federal-State-private industry partnership, with resources to counteract these potential losses. These Special Research Grants will specifically provide for the collection, improvement, evaluation, maintenance, and distribution of special genetic and cytogenetic stocks.

These funds will support evaluation of the tomato germplasm collection at Ames, Iowa and the potato germplasm collection at Sturgeon Bay, Wisconsin.

- (g) An increase of \$200,000 for Special Research Grants for pesticide impact assessment research (\$1,810,000 available in 1981).

Need for Change: The National Agricultural Pesticide Impact Assessment Program was organized in 1977 and has been providing benefit assessment information for pesticides since that time. However, the need for more definitive data on exposure of people and the environment to specific pesticide uses and better data on the economic impact that would result from cancellation of specific uses is not being met fast enough at the current level of support. Further studies will be necessary to justify the continuation of currently-registered uses where additional data are considered necessary by EPA to satisfy new regulatory requirements.

Nature of Change: The increased funding will be used to strengthen and accelerate the existing program and information system to provide high quality data for use by assessment teams in documenting the benefits of specific pesticide uses. It also will support assessment on a commodity basis and permit all pest and pesticide questions for a given commodity to be looked at together. The commodity assessment approach will provide data for individual uses and also will provide a basis for comparing alternative control measures.

- (h) A decrease of \$2,016,000 for selected Special Research Grants (\$2,016,000 available in 1981) consisting of:

Dried bean research in North Dakota	-\$25,000
Soybean cyst nematode research in Missouri.....	-250,000
Bean and beet research in Michigan.....	- 75,000
Mushroom byproduct utilization research in Pennsylvania.....	- 38,000
Aquaculture research at Stoneville, Mississippi.....	-150,000
Dairy photoperiod research in Michigan.....	-35,000
Bean flour research in Michigan, Texas	-103,000
Soil and water conservation in Alaska.....	-290,000
Peach tree short life research in South Carolina....	-100,000
Blueberry shoestring virus control in Michigan.....	-100,000
Mount St. Helens research.....	-850,000
	<u>-2,016,000</u>

Need for Change. This decrease realigns research effort at this time since prior funding has already directed considerable attention to these areas. The research grants funded in fiscal year 1981 and prior years will be used over a period of up to 5 years for completion of studies. The level of funding and the time period of support provided by these grants will yield important information. As results of this research become known, an assessment can be made of the need for augmenting this base of scientific knowledge developed by these programs.

Nature of Change. This change will eliminate new research projects in the specific areas of research identified above. Amounts allotted to the States on a formula basis permit State institutions to fund research in those areas that they identify as high priority and could be a possible source of funding for these programs if the States wish to continue the research.

- (5) An increase of \$40,000 for Alcohol Fuels research for increased operating costs (\$500,000 available in 1981).

Need for Change: The Alcohol Fuels Grant program is designed to provide accelerated solutions for producing alcohol from agricultural commodities and forestry products as a substitute for alcohol made from petroleum products.

Rising operating costs have reduced the scope of problem-solving that can be accomplished effectively within the monetary limits of each grant award. Program effectiveness under alcohol fuels research grants is especially vulnerable to inflationary costs because project budgets are planned, and lump sum awards made, to cover research of several year's duration. This increase allows for inflationary costs anticipated over the duration of Alcohol Fuels Research Grant projects and permit high priority issues to be addressed at a level commensurate with the Nation's needs without sacrificing program effectiveness.

Nature of Change: This increase will provide for offsetting inflationary costs anticipated by these institutions in conducting research essential to Department programs.

- (6) An increase of \$52,000 for research under the Native Latex Act for increased operating costs (\$650,000 available in 1981).

Need for Change: The annual rate of inflation has increased the costs of maintaining the current ongoing level of activity in the Native Latex program.

Nature of Change: This increase will provide for offsetting inflationary costs anticipated by the institutions in carrying out this research.

- (7) An increase of \$13,000,000 for Competitive Research Grants as follows: (\$16,000,000 available in 1981).

- (a) An increase of \$1,300,000 for increased operating costs.

Need for Change: The Competitive Research Grant program is designed to provide fundamental knowledge that will be used by scientists doing applied research, and to provide accelerated solutions to high priority food and agricultural problems.

Rising operating costs essential to this research have reduced the scope of accomplishments and effectiveness of this program. Program effectiveness under Competitive Research Grants is especially vulnerable to inflation because project budgets are planned and lump sum awards are made to cover research of several year's duration. This increase in funds will make allowance for inflationary costs anticipated over the duration of Competitive Research Grant projects and will permit high priority issues to be addressed at a level commensurate with the Nation's needs without sacrificing program effectiveness.

Nature of Change: This increase provides for offsetting inflationary costs anticipated by the institutions performing basic research projects.

- (b) An increase of \$8,700,000 for Competitive Research Grants for plant science research (\$13,000,000 available in 1981.).

Need for Change. During the first three years of operation of this program, fiscal years 1978-1980, 1,894 basic research proposals in four areas of plant science were received. Funding requested to support the research outlined in the 1,894 research proposals totaled approximately \$287 million. Over half of the research proposals submitted were judged by peer panels of practicing research scientists to be worthy of support, however, less than a quarter of the applications were funded even though the duration of the projects and the support per year were reduced substantially from those proposed by the scientists. The data for the three year period indicate that there is a vast resource of available scientific expertise capable of designing and conducting fundamental research on the highest priority problems related to crop, food, and fiber production to obtain fundamental knowledge necessary to increase crop productivity and to insure a dependable food supply. The increased funding proposed for FY 1982 will permit utilizing this vast resource of scientific expertise to provide a broader spectrum of research approaches in the four areas that have received major emphasis under the Competitive Research Grants Program and to initiate research in a new area of plant science.

The four continuing target research areas are biological nitrogen fixation, photosynthesis, genetic mechanisms for crop improvement, and biological stress on plants. A new area on plant metabolism dealing with responses to environmental stresses will be initiated.

Biological Nitrogen Fixation - Nitrogen is the element that most commonly limits crop production. Nitrogen fertilizers are expensive and represent a large energy input to crop production. Thus enhancement of biological nitrogen fixation capacity in plant-soil-microbial associations is of major importance. Major emphasis has been given to research aimed at understanding nitrogen fixing mechanisms in both symbiotic and free living organisms. Much has been learned about the biochemistry of nitrogenase, the enzyme that catalyzes nitrogen fixation, and the genes that regulate the enzyme's synthesis. The nature of the symbiotic relationship and the mechanisms by which organisms improve the efficiency of the nitrogen fixation process have been partially elucidated. These studies need to be expanded. Additional studies on the metabolic fate of fixed nitrogen in the plant-soil-microbe ecosystem are needed. This basic information is providing a base for enhancing the process in currently known systems and for developing new nitrogen fixing associations, by genetic transfer or other means, for crop species not now possessing this capability.

Photosynthesis - Photosynthesis involves the biological conversion of solar energy and atmospheric carbon dioxide into products useful to man. Major areas of study are the absorption of sunlight and transfer of its energy to several pigment systems, the structure and function of photosynthetic membranes responsible for formation of high energy

compounds, and the regulation of carbon dioxide fixation and distribution of photosynthetic products within the plant. Although much has been learned about the microscopic structure of membranes, the location of pigments, and the key enzyme involved in photosynthesis, much remains to be investigated in these areas. Research needs to be expanded to investigate the regulation of key processes involved in photosynthesis and to apply new recombinant DNA technology to studies on genetics of chloroplast components.

Genetic Mechanisms for Crop Improvement - The major thrust of this program is to develop new approaches for obtaining genetic modifications and gene transfer that could contribute to crop improvement. Major areas of emphasis include studies on plant gene structure and regulation, biosynthesis and accumulation of seed protein, and basic genetic and cytogenetic studies on transfer, incorporation, and utilization of alien genes from wild germplasm following wide crosses and embryo culture. There is a need to further expand these areas to include studies on basic factors related to successful protoplast fusion, gene introduction vehicles, and the genetic basis of resistance to control by chemicals. Recent advances in recombinant DNA technology show great promise for gaining a better understanding of gene regulation in crop plants.

Biological Stress on Plants - Crop losses due to biological stress may run as high as one-third of the actual yield. Pests such as insects, nematodes, weeds, and pathological microorganisms damage plants and reduce yields by interfering with key processes of plant growth. Little is known about the mechanisms by which these pests reduce yield, or how the impact of these stresses can be minimized. The major emphasis of this program has been on the interactions of pests with the host plant. Insufficient understanding of those interactions has hindered development of strategies for reducing damage caused by pest-generated stresses. Much has been learned about insect biology and the possibilities for biological rather than chemical control. The form and function of plant viruses and other microbes, the mechanisms of action of fungal toxins, and the physiology of the host-pathogen interactions are under investigation. There is a need to initiate additional research using molecular techniques to define the mechanisms of action of bacterial pathogenicity, and investigations on the metabolic changes occurring in the host plant when an insect or pathogen interacts with the host plant. These studies should provide a knowledge base for designing successful integrated pest management programs that rely heavily on biological control of pests.

Plant Metabolism - Competitive Research Grants for plant science research will be expanded to include the area of plant metabolism. Environmental stresses affecting crop production include temperature extremes, insufficient water and high soil salinity. Research is needed to investigate the main sites of response to stress in the plant such as the structure and function of various membrane systems, energy transfer systems, enzyme activity and hormonal regulation of the response. Technical problems in isolating pure plant membranes whose structure or function has not been altered during isolation have hindered the characterization of plant membranes and their structure-function relationships.

Nature of Change. Research under the biological nitrogen fixation program will be expanded to learn more about the mechanisms of nitrogen fixation, the nature of the symbiotic relationship, and the metabolic fate of fixed nitrogen in the plant-soil-microbe ecosystem.

Photosynthesis research will include investigations on the regulation of key processes involved in photosynthesis and the application of new recombinant DNA technology to studies on genetics of chloroplast components.

For studies on genetic mechanisms for crop improvement, basic factors related to successful protoplast fusion, gene introduction vehicles, and the genetic basis of resistance to control by chemicals will be investigated.

Research on biological stress on plants will be expanded to include molecular techniques to define the mechanisms of action of bacterial pathogenicity. Metabolic changes occurring in the host plant in response to an interaction with an insect or pathogen will be investigated.

Research on plant metabolic changes resulting from environmental stress will be directed towards the development of high speed physical techniques and highly sensitive biochemical methods in order to determine both structure and function of various membranes. As the systems become better characterized, structure-function relationships will be examined.

- (c) An increase of \$3,000,000 for Competitive Research Grants for human nutrition research (\$3,000,000 available in 1981).

Need for Change. During fiscal years 1978-1980, the first three years of operation of the Competitive Research Grants program, 671 basic research proposals in human nutrition were received. The amount requested to support the research outlined in the 671 research proposals totaled approximately \$122 million. Less than one-sixth of the proposals could be funded with available funds. During the first three years of operation, this research has focused primarily on two areas: improvement and development of analytical techniques and the study of trace mineral availability and functions. Projects supported by this program have successfully generated new methods for trace mineral analysis using non-radioactive heavy isotopes in place of potentially dangerous radioactive isotopes. The monoclonal antibody technique is being applied to the detection of different forms of essential vitamins. Improved procedures have also emerged by exploration of high performance liquid chromatography. Trace mineral studies are an area of vital concern and intense current interest. Studies have demonstrated that trace minerals, especially zinc, are likely to be in short supply in the diet of the young, the pregnant and the elderly. Clarification of the cost in health and vitality of these marginal intakes is urgently needed. An important interaction has been revealed between corticosteroids and the tissue and subcellular distribution and exchange of trace minerals. Diabetics have been found to generate significant shifts of trace minerals between organs raising speculation into the role of trace elements in the management of this widespread disease. Basic studies on the influence of dietary fiber and other substances on trace mineral availability are yielding data

vital to wise and effective nutrition counseling. It is becoming evident that the rapid and efficient development and operation of the immune systems is highly intertwined with nutrient supply and balance but much more work is necessary to clarify and quantify these relationships. Much new basic research is needed to devise appropriate means of assessing adequacy and to determine the consequences of inappropriate nutrient balance or intake.

Nature of Change. Research will focus on the nutrient requirements of the adolescent and elderly persons. Studies will be undertaken to develop appropriate techniques for assessing the adequacy of nutrient intake. The interaction of nutrition with disease resistance will be explored.

- (8) A decrease of \$6,500,000 for Animal Health and Disease Research, Sec. 1433, P.L. 95-113 (\$6,500,000 available in 1981).

Need for Change. Seventy-eight institutions are currently eligible to receive payments under formula provisions of this program first funded in FY 1979. Funds have not been adequate to support a viable program with so many eligible institutions. Animal health and disease research will continue to be conducted by Federal and State research institutions under other authorizations which provide opportunity for more concentrated efforts in solving high priority problems of national significance.

Nature of Change. This portion of the animal health and disease research program is proposed for elimination. Ongoing Federal and State research programs will sustain the overall animal health and disease research efforts. Research initiated under this program can be continued by the States as part of their ongoing programs if they so desire.

- (9) An increase of \$139,000 for Federal Administration (direct appropriation) (\$1,698,000 available in 1981).

- (a) An increase of \$121,000 for increased operating costs.

Need for Change: Increased non-salary operating costs of administering the Cooperative Research programs result from the annual rate of inflation.

Nature of Change. This increase will ameliorate the affect of inflation and the cost of administering the Cooperative Research program.

- (b) An increase of \$18,000 for fiscal year 1981 pay increases.

Proposed Legislation, Proposed for Later Transmittal

An increase of \$10,000,000 for a facilities construction program at the 1890 Colleges and Tuskegee Institute (\$10,000,000 supplemental funding proposed in 1981).

Need for Change: Section 1445 of P.L. 95-113 authorized continued Federal funding of the agricultural research programs carried out by the 16 land-grant colleges of 1890 and Tuskegee Institute. Existing facilities utilized for research at these institutions need to be renovated and improved to provide the conditions necessary to conduct top quality research. In addition, new facilities need to be constructed since either the existing ones are not adequate for the conduct of highly complex research, or the existing facilities do not contain adequate space for the current staff and space needs for their projected research programs. The institutions have had to encroach on the space of resident instruction and other campus programs in order to have the staff and programs authorized under current funding levels.

Nature of Change: The proposed funds would permit a five year grant program at \$10 million per year for facility construction at the 17 campuses of the 1890 colleges and Tuskegee Institute. Authorizing legislation is required. This program would provide funding for capital improvements including the major upgrading of existing facilities to meet adequate working conditions, to improve operating efficiency, and to meet new program requirements for food and agricultural research. This program would provide a research program commensurate with the role of these institutions in participating with 1862 institutions as partners to meet the needs of their States. One of the grant selection criteria would be the completeness of the schools' plans to integrate the new facilities into their overall, long-range education plans (e.g., plans for increasing faculty, housing new students, etc.). SEA-CR would monitor the schools comprehensive plans to assure that the schools can fully utilize their new research capacity.

SCIENCE AND EDUCATION ADMINISTRATION - COOPERATIVE RESEARCH

STATUS OF PROGRAM

The funds appropriated for Cooperative Research provide the Federal Government's support for land-grant agricultural experiment stations, approved schools of forestry, the 1890 land-grant institutions and Tuskegee Institute, Colleges of Veterinary Medicine and other eligible institutions in the various States and in Puerto Rico, Guam, the Virgin Islands, and the District of Columbia.

The State institutions conduct research and experiments on the problems continuously encountered in the development of a permanent and sustaining agriculture and forestry, and in the improvement of the economic and social welfare of rural and urban families. Because of differences in climate, soil, market outlets, and other local conditions, each State has distinct problems in the production and marketing of crops and livestock. Farmers, foresters, and rural people in the individual States naturally look to their State agricultural experiment stations, universities, and colleges for solution of the State and local problems and request services to help meet changing conditions.

Research programs at State institutions, to be most effective, include participation in regional and national programs. Joint effort by a group of State institutions is the most effective and often the only practical approach to problems of common interest. The stations are acting together as regional groups to provide cooperative coordinated attacks on problems of regional and national interest. In a similar manner, the research programs of the State institutions and the Department of Agriculture are complementary and interdependent.

The Federal formula funds constitute a powerful force in bringing about inter-State cooperation and Federal-State collaboration in the planning and conduct of this overall program of agricultural research. Therefore, the impact of the Federal formula funds cannot be fully evaluated solely on the basis of the amount of funds provided.

Research at the State institutions is organized into a program of projects that is submitted for approval by Cooperative Research. The program of projects is financed wholly or in part from Federal formula and grant funds. Programs and projects are evaluated periodically with station scientists by administrators and technical staff of Cooperative Research. The evaluation includes consideration of quality and productivity of the program and projects. The continuing process of research evaluation by station scientists and the staff of Cooperative Research results in a dynamic program with approximately 15 to 20 percent of the projects being replaced by new and/or revised projects each year.

Table I
Distribution of Federal Payments to States for Research at State Agricultural Experiment Stations and Other State Institutions - Fiscal Year 1980

State	Hatch Act, as amended			Coop.			1890			Competitive			Animal			Federal			
	Regular	Regional	Formula	Total	Research	(M-S)	Forstry	Colleges &	Tuskegee	Research	Grants	Rural	Health & Disease	Direct	Federal Funds	Admin.	Appro.		
Alabama.....	2,148,570:	553,154:		2,701,724:	324,115:	2,107,190:	438,489:	...	...	27,948:	155,650:	...	5,755,116	...	...	1,135,762	...		
Alaska.....	585,915:	94,196:	680,111:	152,409:	...	286,300:	...	...	559,290:	70,000:	10,478:	66,874:	...	2,162,716	...	...	3,999,011	...	
Arizona.....	792,419:	498,527:	1,290,946:	165,128:	...	255,360:	115,000:	24,529:	83,340:	...	2,241,900:	32,862:	304,025:	7,444,769	...	...	2,728,026	...	
Arkansas.....	1,820,904:	484,738:	2,305,642:	305,037:	910,103:	1,184,484:	2,241,900:	...	1,184,484:	2,241,900:	100,000:	12,920:	16,840:	...	1,468,711	...	...	1,362,655	...
California.....	2,297,623:	1,053,400:	3,351,023:	330,475:	...	581,307:	72,000:	15,092:	232,980:	...	7,908:	14,901:	...	407,561	...	...	3,700,993	5,636,678	
Colorado.....	1,047,665:	645,652:	1,693,317:	133,330:	...	5,638:	107,893:	5,638:	...	430,367:	309,750:	21,925:	108,609:	...	3,700,993	5,636,678	398,023	1,061,360	
Connecticut.....	898,627:	326,793:	1,225,420:	107,893:	...	45,210:	57,017:	365,915:	45,210:	...	290,000:	...	...	...	...	...	...	1,968,599	5,269,422
Delaware.....	627,358:	244,456:	871,814:	57,017:	...	...	...	...	...	309,750:	272,000:	32,135:	177,150:	...	4,497,575	...	...	4,409,734	...
District of Columbia.....	57,932:	59,629:	117,561:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Florida.....	1,443,727:	439,645:	1,883,372:	247,801:	699,169:	430,367:	336,834:	1,129,423:	573,630:	...	...	...	...	...	...	...	...	...	...
Georgia.....	2,343,918:	771,588:	3,115,506:	393,023:	...	...	...	...	...	5,000:	...	...	...	...	...	...	...	...	...
Guam.....	314,855:	78,168:	...	...	...	...	...	...	...	85,550:	...	7,392:	8,481:	...	...	...	...	...	...
Hawaii.....	637,662:	252,539:	890,201:	69,736:	...	209,867:	50,000:	50,000:	228,723:	...	437,210:	899,025:	47,489:	200,909:	...	...	...	...	...
Idaho.....	971,929:	393,025:	1,364,954:	184,206:	...	357,919:	633,700:	43,813:	158,768:	...	357,919:	633,700:	43,813:	131,077:	...	...	...	...	...
Illinois.....	2,837,118:	663,465:	3,500,583:	162,313:	3,172,298:	101,533:	101,533:	294,377:	101,533:	...	70,000:	83,716:	347,347:	...	...	...	...	...	...
Indiana.....	2,569,985:	602,313:	461,926:	2,147,564:	292,318:	831,385:	831,385:	451,331:	298,677:	...	180,000:	180,000:	26,19:	194,993:	...	...	...	...	...
Iowa.....	2,668,231:	844,530:	3,512,761:	1,679,194:	555,014:	2,234,208:	88,814:	318,294:	2,234,208:	88,814:	234,311:	155,000:	41,640:	107,071:	...	5,177,869	...	...	...
Kansas.....	2,663,625:	553,047:	3,216,672:	209,644:	1,213,531:	209,644:	1,213,531:	451,331:	292,318:	831,385:	451,331:	5,000:	23,537:	113,464:	...	3,864,599	...	...	1,658,266
Kentucky.....	1,685,638:	461,926:	2,147,564:	1,218,764:	340,602:	1,218,764:	1,218,764:	105,785:	298,677:	...	104,771:	104,771:	603,575:	17,723:	...	3,042,728	...	...	3,175,540
Louisiana.....	878,162:	340,602:	1,218,764:	1,635,240:	1,216,672:	1,216,672:	1,216,672:	115,257:	1,635,240:	1,216,672:	234,311:	155,000:	41,640:	107,071:	...	5,177,869	...	...	2,570,598
Maine.....	1,206,675:	428,565:	1,635,240:	1,476,154:	120,611:	...	120,611:	652,563:	285,958:	...	447,600:	470,000:	43,516:	207,327:	...	4,527,749	...	...	5,124,259
Maryland.....	1,057,818:	418,336:	1,476,154:	1,216,672:	1,216,672:	1,216,672:	1,216,672:	447,600:	3,117,864:	241,442:	317,756:	1,036,022:	230,827:	104,000:	66,546:	75,867:	...	4,737,911	
Massachusetts.....	2,627,446:	589,064:	3,216,510:	2,147,564:	587,016:	3,117,864:	2,147,564:	447,600:	196,925:	...	1,118,759:	1,118,759:	500,040:	616,000:	39,131:	163,016:	...	5,648,972	
Michigan.....	2,530,848:	587,016:	3,117,864:	1,635,240:	654,807:	2,906,893:	1,635,240:	652,563:	196,925:	...	6,422:	...	778,200:	42,727:	148,301:	...	...	...	5,124,259
Minnesota.....	1,541,623:	595,207:	2,136,830:	63,376:	575,882:	2,136,830:	2,136,830:	343,873:	63,376:	...	343,873:	180,800:	180,800:	24,703:	13,518:	106,421:	...	...	4,527,749
Mississippi.....	2,252,086:	524,219:	2,996,022:	216,004:	524,219:	2,996,022:	2,996,022:	50,657:	1,58,768:	...	5,000:	5,000:	104,000:	66,546:	75,867:	7,166:	30,751:	...	4,737,911
Missouri.....	926,814:	439,979:	1,366,793:	1,502,111:	926,814:	1,502,111:	1,502,111:	50,657:	1,58,768:	...	299,459:	243,000:	14,898:	31,407:	...	1,400,005:	...	...	2,406,268
Montana.....	1,541,623:	595,207:	2,136,830:	63,376:	575,882:	2,136,830:	2,136,830:	343,873:	63,376:	...	75,320:	...	10,802:	10,802:	49,104:	...	...	1,361,465	
Nebraska.....	705,100:	244,967:	1,703,252:	114,252:	664,298:	1,086,549:	1,086,549:	139,690:	139,690:	...	...	...	1,010,096:	1,136,650:	78,037:	227,64:	...	6,271,954	
Nevada.....	1,038,954:	821,634:	264,915:	3,552,617:	981,424:	3,552,617:	266,880:	266,880:	311,396:	1,502,111:	225,585:	215,000:	52,593:	125,158:	...	6,72,277	...	...	6,72,277
New Hampshire.....	3,547,043:	793,391:	4,340,434:	3,547,043:	1,168,135:	1,563,347:	37,938:	37,938:	3,404,957:	190,566:	32,024:	240,000:	17,737:	67,213:	...	1,958,259	...	...	1,958,259
New Jersey.....	3,104,796:	636,161:	3,404,957:	3,404,957:	3,404,957:	3,404,957:	3,404,957:	3,404,957:	3,404,957:	3,404,957:	811,297:	800,000:	50,843:	150,497:	...	5,744,160:	...	...	5,744,160:

State	Hatch Act, as amended			Coop.			1890			Competitive:			Animal Health & Disease			Total Federal	
	Regular	Regional	Research	Forestry	Colleges & Research	Tuskegee	Special Research	Rural Research	Development	Grants	Act	Research	Direct	Research	Appro.	Federal Funds	
	Total	(M-S)		Total	(M-S)		Total	Grants									
Oklahoma.....	1,625	313	398	662	2,023	375	171,487	806,205	299,456	110,000	23,336	154,782	...	...	3,588,641
Oregon.....	1,209	231	623	959	1,833	190	349,553	225,606	699,000	55,455	113,439	...	...	3,276,243	
Pennsylvania.....	3,140	672	799	977	3,940	649	254,161	572,730	195,000	49,096	145,085	...	...	5,156,721	
Puerto Rico.....	2,470	393	492	912	2,963	305	...	5,320	...	34,225	19,280	...	...	3,022,130	
Rhode Island.....	584	193	253	578	837	771	44,298	...	5,000	...	7,119	12,199	...	...	906,387
South Carolina.....	1,871	366	456	749	2,328	115	260,520	343,954	8,489	54,400	24,517	28,671	...	...	3,048,666
South Dakota.....	1,190	120	398	625	1,588	745	76,095	163,334	...	18,560	118,702	...	...	1,965,436	
Tennessee.....	2,619	440	566	371	3,185	811	222,363	1,130,066	8,142	146,000	38,662	73,301	...	...	4,804,345
Texas.....	3,323	980	806	230	4,130	210	279,599	1,529,257	759,236	340,000	48,565	425,692	...	...	7,512,559
Utah.....	725	723	453	891	1,179	614	95,174	...	93,030	127,000	9,264	52,768	...	...	1,556,850
Vermont.....	751	829	213	599	965	428	177,847	...	5,000	65,000	10,114	19,305	...	...	1,242,694
Virginia.....	2,251	169	518	169	2,769	338	273,239	913,506	142,825	357,000	32,386	85,377	...	...	4,573,671
Virgin Islands.....	171	000	79	301	250	301	...	...	5,000	...	...	...	...	...	255,301
Washington.....	1,380	999	851	829	2,232	828	343,194	...	396,648	718,000	20,705	131,806	...	...	3,843,181
West Virginia.....	1,450	662	356	967	1,807	029	203,285	...	28,395	...	18,765	21,579	...	...	2,079,053
Wisconsin.....	2,541	165	691	230	3,232	395	235,082	...	293,991	483,000	43,317	225,816	...	...	4,513,601
Wyoming.....	676	301	351	285	1,027	586	82,455	...	5,000	...	8,862	50,106	...	...	1,174,009
Other.....	...	...	141	766	141	766	25,234	...	...	...	...	...	...	...	167,000
Subtotal.....	87,101	863	26,829	616	113,931	479	9,700,000	16,268,861	14,742,060	15,035,000	1,440,000	5,760,000	...	...	176,877,400
Committee of Nine (Travel).....	...	...	10	013	10	013	...	...	...	...	...	...	...	...	10,013
Unobligated balance.....	816	485	18	934	835	419	982	589	...	...	...	...	...	...	1,818,008
Subtotal.....	87,918	348	26,858	563	114,776	911	9,700,000	17,251,450	14,742,060	15,035,000	1,440,000	5,760,000	...	...	178,705,421
Federal administration.....	...	...	3,271	870	300	000	533,550	455,940	465,000	60,000	240,000	1,482,000	...	...	6,808,360
Unobligated balance.....	...	...	41	219	...	...	533,550	455,940	465,000	60,000	240,000	1,482,000	...	...	41,219
Subtotal.....	...	...	3,313	089	300	000	533,550	455,940	465,000	60,000	240,000	1,482,000	...	...	6,849,579
Penalty Mail.....	...	...	509	051	...	...	...	...	...	...	...	...	...	...	509,051
Unobligated balance.....	...	...	-33	051	...	...	...	...	...	...	...	...	...	...	-33,051
Subtotal.....	...	...	476	000	...	...	...	...	...	...	...	...	...	...	476,000
TOTAL.....	87,918	348	26,858	563	118,566	000	10,000,000	17,785,000	15,198,000	15,500,000	1,500,000	6,000,000	1,482,000	186,031,000	

Table 2
Available Funds for Cooperative Research
(In Dollars)

Program/State	: Fiscal Year 1980 Actual	Fiscal Year 1981 Estimate	Fiscal Year 1982 Estimate
I. Payments under the Hatch Act:		a/	a/
a. Distributed by formula:			
Alabama	\$2,148,570	2,280,756	2,553,147
Alaska	585,915	623,764	701,759
Arizona	792,419	844,632	952,226
Arkansas	1,820,904	1,937,468	2,177,663
California	2,297,623	2,452,292	2,771,012
Colorado	1,047,665	1,121,017	1,272,172
Connecticut	898,627	961,997	1,092,581
Delaware.....	627,358	667,813	751,178
District of Columbia.....	57,932	397,617	461,881
Florida	1,443,727	1,548,311	1,763,824
Georgia	2,343,918	2,495,253	2,807,104
Guam	314,855	531,232	601,108
Hawaii	63,662	675,879	754,375
Idaho	971,929	1,041,279	1,184,184
Illinois	2,837,118	3,058,841	3,515,738
Indiana	2,569,985	2,774,862	3,197,044
Iowa	2,668,231	2,884,198	3,329,233
Kansas	1,679,194	1,804,508	2,062,614
Kentucky	2,663,625	2,862,181	3,263,903
Louisiana	1,685,638	1,797,620	2,028,378
Maine	878,162	935,437	1,053,462
Maryland	1,206,675	1,292,044	1,467,961
Massachusetts	1,057,818	1,130,111	1,279,083
Michigan	2,627,446	2,827,283	3,239,081
Minnesota	2,530,848	2,734,426	3,153,933
Mississippi	2,252,086	2,389,329	2,672,141
Missouri	2,471,803	2,655,264	3,033,316
Montana	926,814	992,970	1,129,296
Nebraska	1,541,623	1,659,031	1,900,970
Nevada	575,882	612,944	689,317
New Hampshire	705,109	751,907	848,362
New Jersey	1,038,954	1,111,380	1,260,625
New Mexico	821,634	875,340	986,011
New York	2,571,193	2,760,955	3,151,992
North Carolina	3,547,043	3,792,060	4,296,958
North Dakota	1,168,135	1,253,630	1,429,806
Ohio	3,104,796	3,341,809	3,830,215
Oklahoma	1,625,313	1,736,423	1,965,383
Oregon	1,209,231	1,295,686	1,473,840
Pennsylvania	3,140,672	3,369,587	3,841,303
Puerto Rico	2,470,393	2,631,391	2,963,153
Rhode Island	584,193	621,750	697,672
South Carolina	1,871,366	1,987,826	2,227,812
South Dakota	1,190,120	1,279,385	1,463,330
Tennessee	2,619,440	2,800,725	3,174,293
Texas	3,323,980	3,550,591	4,017,561
Utah	725,723	772,390	868,554
Vermont	751,829	804,879	909,051
Virginia	2,251,169	2,403,669	2,717,920
Virgin Islands	171,000	522,733	591,190
Washington	1,380,999	1,480,032	1,684,106
West Virginia	1,450,062	1,540,188	1,725,906
Wisconsin	2,541,165	2,743,805	3,161,378
Wyoming	676,301	721,132	813,511
American Samoa.....	--	500,748	567,552
Micronesia.....	--	513,248	582,135
Subtotal	87,101,863	95,153,628	108,109,308
b. Regional research funds b/	26,829,616	29,358,813	33,857,313
Committee of Nine travel	10,013	12,000	12,000
Total agricultural research under the Hatch Act	113,941,492	124,524,441	141,978,621
For administration	3,271,870	3,614,559	4,154,379
For penalty mail	509,051	476,000	476,000
Subtotal	117,722,413	128,615,000	146,609,000

Program/State	: Fiscal Year : 1980 Actual	: Fiscal Year : 1981 Estimate	: Fiscal Year : 1982 Estimate
2. Cooperative forestry research:			
Research program c/	9,700,000	10,450,780	11,912,570
For administration	300,000	323,220	368,430
Subtotal	10,000,000	10,774,000	12,281,000
3. Payments to 1890 colleges & Tuskegee Inst.:			
Research program	16,268,861	18,691,900	21,332,240
For administration	533,550	578,100	659,760
Subtotal	16,802,411	19,270,000	21,992,000
4. Special research grants:			
Research program	14,742,060	17,679,220	20,134,290
For administration	455,940	546,780	622,710
Subtotal d/.....	15,198,000	18,226,000	20,757,000
5. Competitive research grants:			
Research program	15,035,000	15,520,000	28,130,000
For administration	465,000	480,000	870,000
Subtotal	15,500,000	16,000,000	29,000,000
6. Rural development research:			
Research program	1,440,000	--	--
For administration	60,000	--	--
Subtotal	1,500,000	--	--
7. Animal health and disease research:			
Research program	5,760,000	6,240,000	--
For administration	240,000	260,000	--
Subtotal	6,000,000	6,500,000	--
8. Federal administration(direct appropriation):			
Unobligated balance	1,826,176	--	--
Subtotal, appropriated funds	186,031,000	201,083,000	232,476,000
Reimbursements	1,317,463	2,000,000	2,000,000
Allotment from:			
Forest Service	844,532	1,080,000	1,080,000
Total available or estimate	188,192,995	204,163,000	235,556,000

- a/ Payments under the Hatch Act, distributed by formula-tentative pending final adjustments for American Samoa and Micronesia.
- b/ Allotted to States on the basis of recommendation by a committee of experiment station directors and approved by Cooperative Research.
- c/ Apportioned among the States on a basis determined by the Secretary after consultation with a national advisory board of not less than seven officials of forestry schools selected by eligible institutions.
- d/ In fiscal years 1980 and 1981, includes \$500,000 for alcohol fuels research grants in accordance with section 1419 of Public Law 95-113 and \$650,000 for research authorized by the Native Latex Commercialization and Economic Development Act of 1978. In fiscal year 1982, includes \$540,000 for alcohol fuels research and \$702,000 for research authorized by the Native Latex Act.

Table 3
Estimated Distribution by Research Programs of Federal Payments to State
Agricultural Experiment Stations, Schools of Forestry, Colleges of Veterinary
Medicine, and 1890 Land-Grant Institutions and Tuskegee Institute
(In thousands of dollars)

	<u>Fiscal Year 1981 Estimate</u>
Natural Resources Programs	
Soil and land use	6,333
Water and watersheds <u>1/</u>	2,086
Environmental quality	6,102
Fish and wildlife	900
Outdoor recreation	694
Weather	681
Remote sensing	141
Forestry Resources Program	
Forestry <u>2/</u>	13,449
Crop Resources Programs	
Protection from disease, insect pests, and weeds <u>3/</u>	24,533
Crop varieties and production systems for dependable and efficient production	44,197
Quality improvement, quality maintenance, and marketing of crops	8,061
Animal Resources Programs	
Meat animal research	23,310
Dairy research	10,194
Poultry research	7,347
Other animal research	2,612
Aquatic foods and feedstuffs	2,115
Quality improvement, quality maintenance, and marketing of animal products	5,823
People, Communities, and Institutions Resources Programs	
Food and nutrition	9,942
Food safety	3,270
Rural development	10,624
Insects affecting man	672
Competition, Trade Adjustments, Price and Income Policy	
Farm adjustments necessary to increase farm income	3,613
Marketing and competition	6,407
Penalty Mail	476
Federal administration	<u>7,501</u>
TOTAL	<u>201,083</u>

1/ Includes water pollution.

2/ McIntire-Stennis funds are also included under other appropriate resource programs.

3/ Includes activities to reduce or avoid the use of pesticides.

Table 4
Available Funds for McIntire-Stennis Cooperative Forestry Research
(In Dollars)

<u>State</u>	Fiscal Year 1980 Actual	Fiscal Year 1981 Estimate	Fiscal Year 1982 Estimate
Alabama.....	\$324,115	\$348,571	\$398,836
Alaska.....	152,409	164,766	179,501
Arizona.....	165,128	157,959	195,168
Arkansas.....	305,037	328,148	375,336
California.....	330,475	355,378	406,669
Colorado.....	133,330	151,151	171,668
Connecticut.....	101,893	117,113	132,501
Delaware.....	57,017	62,653	69,834
Florida.....	247,801	273,687	312,669
Georgia.....	336,834	362,186	414,503
Guam.....	- -	- -	- -
Hawaii.....	69,736	83,076	93,334
Idaho.....	228,723	246,457	281,335
Illinois.....	184,206	198,804	226,501
Indiana.....	158,768	171,574	187,334
Iowa.....	101,533	103,498	116,834
Kansas.....	88,814	89,883	101,167
Kentucky.....	209,644	219,227	250,001
Louisiana.....	292,318	321,340	367,502
Maine.....	298,677	314,533	359,669
Maryland.....	126,971	144,344	163,834
Massachusetts.....	120,611	130,729	148,167
Michigan.....	285,958	307,725	351,835
Minnesota.....	241,442	260,072	297,002
Mississippi.....	317,756	334,956	383,169
Missouri.....	216,004	232,842	265,668
Montana.....	196,925	212,419	242,168
Nebraska.....	63,376	69,461	77,667
Nevada.....	50,657	55,845	62,000
New Hampshire.....	158,768	178,382	203,001
New Jersey.....	114,252	123,921	140,334
New Mexico.....	139,690	137,536	156,001
New York.....	266,880	294,110	336,169
North Carolina.....	311,396	341,763	391,002
North Dakota.....	37,938	49,038	54,167
Ohio.....	190,566	205,612	234,335
Oklahoma.....	171,487	185,189	210,835
Oregon.....	349,553	375,801	430,169
Pennsylvania.....	254,161	266,880	304,835
Puerto Rico.....	- -	- -	- -
Rhode Island.....	44,298	42,230	46,334
South Carolina.....	260,520	280,495	320,502
South Dakota.....	76,095	76,268	85,500
Tennessee.....	222,363	239,650	273,502
Texas.....	279,599	287,303	328,335
Utah.....	95,174	110,306	124,667
Vermont.....	177,847	191,997	218,668
Virginia.....	273,239	300,918	344,002
Virgin Islands.....	- -	- -	- -
Washington.....	343,194	368,993	422,336
West Virginia.....	203,285	226,035	257,835
Wisconsin.....	235,082	253,265	289,168
Wyoming.....	82,455	96,691	109,001
Subtotal.....	<u>9,700,000</u>	<u>10,450,780</u>	<u>11,912,570</u>
Federal administration (3%)....	300,000	323,220	368,430
TOTAL.....	<u>10,000,000</u>	<u>10,774,000</u>	<u>12,281,000</u>

Table 5

Payments to 1890 Colleges and Tuskegee Institute
(In Dollars)

	<u>Fiscal Year 1980 Actual</u>	<u>Fiscal Year 1981 Estimate</u>	<u>Fiscal Year 1982 Estimate</u>
ALABAMA			
Alabama A&M University.....	\$1,063,418	\$1,141,397	\$1,284,568
Tuskegee Institute.....	1,043,772	1,121,750	1,264,918
ARKANSAS			
University of Arkansas at Pine Bluff	910,103	979,182	1,106,007
DELAWARE			
Delaware State College.....	365,915	399,485	440,768
FLORIDA			
Florida A&M University.....	699,169	759,847	871,230
GEORGIA			
Fort Valley State College.....	1,129,423	1,218,719	1,382,655
KENTUCKY			
Kentucky State University.....	1,213,531	1,331,178	1,547,108
LOUISIANA			
Southern University.....	831,385	898,985	1,019,361
MARYLAND			
University of Maryland - Eastern Shore.....	607,031	656,381	746,977
MISSISSIPPI			
Alcorn State University.....	1,036,022	1,186,619	1,336,502
MISSOURI			
Lincoln University.....	1,118,759	1,229,402	1,432,474
NORTH CAROLINA			
North Carolina A&T State University	1,502,111	1,739,705	2,008,985
OKLAHOMA			
Langston University.....	806,205	872,131	993,156
SOUTH CAROLINA			
South Carolina State College.....	343,954	991,660	1,116,775
TENNESSEE			
Tennessee State University.....	1,130,066	1,319,897	1,519,568
TEXAS			
Prairie View A&M College.....	1,529,257	1,665,404	1,915,315
VIRGINIA			
Virginia State College.....	913,506	1,152,783	1,318,498
CRIS.....	25,234	27,375	27,375
Subtotal.....	16,268,861	18,691,900	21,332,240
Unobligated balance	982,589	--	--
Federal administration (3%)	533,550	578,100	659,760
TOTAL.....	17,785,000	19,270,000	21,992,000

Table 6
Payments to States - Title V, Rural Development Act of 1972
(In Dollars)

<u>State</u>	<u>Fiscal Year 1980 Actual</u>
Alabama.....	\$27,948
Alaska.....	7,340
Arizona.....	10,478
Arkansas.....	24,529
California.....	32,862
Colorado.....	15,092
Connecticut.....	12,920
Delaware.....	7,908
Florida.....	21,925
Georgia.....	32,135
Hawaii.....	7,392
Idaho.....	14,215
Illinois.....	47,489
Indiana.....	43,813
Iowa.....	83,716
Kansas.....	26,419
Kentucky.....	41,640
Louisiana.....	23,537
Maine.....	11,585
Maryland.....	17,723
Massachusetts.....	14,871
Michigan.....	42,727
Minnesota.....	43,516
Mississippi.....	66,546
Missouri.....	39,131
Montana.....	13,518
Nebraska.....	24,703
Nevada.....	7,166
New Hampshire.....	9,298
New Jersey.....	14,898
New Mexico.....	10,802
New York.....	78,037
North Carolina.....	52,593
North Dakota.....	17,737
Ohio.....	50,843
Oklahoma.....	23,336
Oregon.....	55,455
Pennsylvania.....	49,096
Puerto Rico.....	34,225
Rhode Island.....	7,119
South Carolina.....	24,517
South Dakota.....	18,560
Tennessee.....	38,662
Texas.....	48,565
Utah.....	9,264
Vermont.....	10,114
Virginia.....	32,386

<u>State</u>	<u>Fiscal Year 1980 Actual</u>
Washington.....	\$ 20,705
West Virginia.....	18,765
Wisconsin.....	43,317
Wyoming.....	8,862
Subtotal.....	<u>1,440,000</u>
Federal administration (4%).....	60,000
10 percent to finance work in 2 or more States.....	<u>a/</u>
 TOTAL	 <u>1,500,000</u>

a/ Regional research reflected in Iowa, Mississippi,
New York, and Oregon.

Table 7
Grants for Agricultural Research
Public Law 89-106
(In dollars)

<u>State</u>		Fiscal Year 1980 Grants Awarded
	<u>Special Research Grants</u>	<u>Competitive Research Grants</u>
Alabama.....	\$438,489	---
Alaska.....	286,300	---
Arizona.....	275,690	\$70,000
Arkansas.....	255,360	115,000
California.....	1,034,484	2,241,900
Colorado.....	581,307	72,000
Connecticut.....	5,638	100,000
Delaware.....	45,210	---
District of Columbia.....	---	290,000
Florida.....	430,367	309,750
Georgia.....	573,630	272,000
Guam.....	5,000	---
Hawaii.....	85,550	---
Idaho.....	209,867	50,000
Illinois.....	437,210	899,025
Indiana.....	265,952	633,700
Iowa.....	194,377	70,000
Kansas.....	318,294	180,000
Kentucky.....	234,311	155,000
Louisiana.....	451,331	5,000
Maine.....	105,785	---
Maryland.....	104,771	603,575
Massachusetts.....	115,257	820,000
Michigan.....	652,563	778,200
Minnesota.....	447,600	470,000
Mississippi.....	230,827	104,000
Missouri.....	500,040	616,000
Montana.....	6,422	---
Nebraska.....	243,878	180,800
Nevada.....	5,000	70,000
New Hampshire.....	5,000	---
New Jersey.....	200,257	243,000
New Mexico.....	5,320	---
New York.....	1,010,096	1,136,650
North Carolina.....	225,585	215,000
North Dakota.....	32,024	240,000
Ohio.....	811,297	800,000
Oklahoma.....	299,456	110,000
Oregon.....	225,606	699,000
Pennsylvania.....	572,730	195,000
Puerto Rico.....	5,320	---
Rhode Island.....	5,000	---
South Carolina.....	8,489	54,400
South Dakota.....	69,503	---
Tennessee.....	8,142	146,000
Texas.....	632,336	340,000
Utah.....	93,030	127,000

<u>State</u>	<u>Fiscal Year 1980 Grants Awarded</u>	
	<u>Special Research Grants</u>	<u>Competitive Research Grants</u>
Vermont.....	\$ 5,000	\$ 65,000
Virginia.....	142,825	357,000
Virgin Islands.....	5,000	- -
Washington.....	396,648	718,000
West Virginia.....	28,395	- -
Wisconsin.....	293,991	483,000
Wyoming.....	5,000	- -
Subtotal.....	13,626,560	15,035,000
Federal administration (3%).....	<u>421,440</u>	<u>465,000</u>
TOTAL.....	<u>14,048,000</u>	<u>15,500,000</u>

Alcohol Fuels Research, Section 1419, P.L. 95-113

Indiana.....	\$91,967
Iowa.....	100,000
Nebraska.....	100,000
New Jersey.....	99,202
South Dakota.....	93,831
Subtotal.....	485,000
Federal administration (3%).....	<u>15,000</u>
TOTAL.....	<u>500,000</u>

Native Latex Commercialization and Economic Development Act of 1978

Arizona.....	\$283,600
California.....	150,000
New Mexico.....	70,000
Texas.....	126,900
Subtotal.....	630,500
Federal administration (3%).....	19,500
TOTAL.....	<u>650,000</u>

Table 8
Animal Health and Disease Research
Section 1433, P. L. 95-113
(In Dollars)

<u>State/Recipient</u>	<u>Fiscal Year 1980 Actual</u>
ALABAMA: - Agricultural Experiment Station	\$104,005
- Auburn University, School of Veterinary Medicine	27,320
- Tuskegee Institute, School of Veterinary Medicine	24,325
ALASKA: - Agricultural Experiment Station	9,602
ARIZONA: - Agricultural Experiment Station	66,874
ARKANSAS: - Agricultural Experiment Station	83,340
CALIFORNIA: - Agricultural Experiment Station	218,204
- School of Veterinary Medicine	85,821
COLORADO: - Agricultural Experiment Station and College of Veterinary Medicine	232,980
CONNECTICUT: - Agricultural Experiment Station	16,840
DELAWARE: - Agricultural Experiment Station	14,901
FLORIDA: - Agricultural Experiment Station	94,598
- College of Veterinary Medicine	14,011
GEORGIA: - Agricultural Experiment Station	46,979
- College of Veterinary Medicine	130,171
HAWAII: - Agricultural Experiment Station	8,481
IDAHO: - Agricultural Experiment Station	73,323
- College of Veterinary Medicine	27,517
ILLINOIS: - Agricultural Experiment Station and College of Veterinary Medicine	200,909
INDIANA: - Agricultural Experiment Station and School of Veterinary Medicine	131,077
IOWA: - Agricultural Experiment Station	35,405
- College of Veterinary Medicine	311,942
KANSAS: - Agricultural Experiment Station and College of Veterinary Medicine	194,993
KENTUCKY: - Agricultural Experiment Station	107,071
LOUISIANA: - Agricultural Experiment Station	101,978
- College of Veterinary Medicine	11,486
MAINE: - Agricultural Experiment Station	23,455
MARYLAND: - Agricultural Experiment Station	64,442
- John Hopkins University	15,787
MASSACHUSETTS: - Agricultural Experiment Station	23,705
MICHIGAN: - Agricultural Experiment Station and College of Veterinary Medicine	148,301
MINNESOTA: - Agricultural Experiment Station	81,970
- College of Veterinary Medicine	125,357
MISSISSIPPI: - Agricultural Experiment Station and College of Veterinary Medicine	75,867
MISSOURI: - Agricultural Experiment Station	75,175
- College of Veterinary Medicine	87,841
MONTANA: - Agricultural Experiment Station	106,421
NEBRASKA: - Agricultural Experiment Station	180,942
NEVADA: - Agricultural Experiment Station	30,751
NEW HAMPSHIRE: - Agricultural Experiment Station	16,872
NEW JERSEY: - Agricultural Experiment Station	31,407
NEW MEXICO: - Agricultural Experiment Station	49,104
NEW YORK: - Agricultural Experiment Station	24,621
- College of Veterinary Medicine	203,053
NORTH CAROLINA: - Agricultural Experiment Station	125,158
NORTH DAKOTA: - Agricultural Experiment Station	67,213

<u>State/Recipient</u>	<u>Fiscal Year 1980 Actual</u>
OHIO: - Agricultural Experiment Station	\$98,576
- College of Veterinary Medicine	51,921
OKLAHOMA: - Agricultural Experiment Station	148,637
- College of Veterinary Medicine	6,145
OREGON: - Agricultural Experiment Station	58,795
- School of Veterinary Medicine	54,644
PENNSYLVANIA: - Agricultural Experiment Station	67,793
- Lehigh University	2,791
- School of Veterinary Medicine	74,501
PUERTO RICO: - Agricultural Experiment Station	19,280
RHODE ISLAND: - Agricultural Experiment Station	12,199
SOUTH CAROLINA: - Agricultural Experiment Station	28,671
SOUTH DAKOTA: - Agricultural Experiment Station	118,702
TENNESSEE: - Agricultural Experiment Station and College of Veterinary Medicine	73,301
TEXAS: - Agricultural Experiment Station and College of Veterinary Medicine	425,692
UTAH: - Agricultural Experiment Station	52,768
VERMONT: - Agricultural Experiment Station	19,305
VIRGINIA: - Agricultural Experiment Station and College of Veterinary Medicine	85,377
WASHINGTON: - Agricultural Experiment Station	37,457
- College of Veterinary Medicine	94,349
WEST VIRGINIA: - Agricultural Experiment Station	21,579
WISCONSIN: - Agricultural Experiment Station	225,816
WYOMING: - Agricultural Experiment Station	50,106
Subtotal	<u>5,760,000</u>
Federal administration (4%)	<u>240,000</u>
TOTAL	<u>6,000,000</u>

PAYMENTS UNDER THE HATCH ACT

The Hatch program of research at the State agricultural experiment stations is aimed at improving rural living conditions, conserving resources, and promoting efficient production, marketing, distribution, and utilization of crops and livestock essential to the food supply or health and welfare of the people of the United States.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

1. NATURAL RESOURCES

Current activities: 11 percent of total Hatch funds for research. Included are soil and land use, water and watersheds, outdoor recreation, environmental quality, fish and wildlife, and remote sensing.

Selected examples of recent progress:

Water Storage and Runoff. A model for calculating surface storage of water and runoff amounts was developed by engineers at the Minnesota Agricultural Experiment Station for a plot using grid elevations. The model, which operates independently of rainfall and infiltration rates, was applied to field observations on sixteen plots, before and after rainfall application. The results showed that limited runoff occurs concurrently with buildup of micro-relief storage. Percentage of area contributing runoff increases by steps. Micro-relief storage was increased three to four times by plowing, but was substantially reduced by subsequent rainfall.

Simplified Drip Irrigation Design. University of Hawaii agricultural engineers have developed a manual for simplified design of drip irrigation systems. The manual enables the designer to select the degree of variation in distribution of water in the field which he can accept. Then the lateral and submain can be rapidly designed for various topographic conditions, field size, types of lateral line and rates of application. In addition, main line design for either simple or complicated distribution systems can be easily handled using the straight energy gradient concept developed at the University of Hawaii. The manual includes charts for design with explanations and examples of their use. For cases of uniform slopes, a pocket-size design calculator consisting of three charts with explanation has also been developed. This calculator is all the designers need in the field for drip irrigation design.

Programmed Irrigation. Test results at the University of Nebraska showed that up to 30 percent of the water normally used in irrigation can be saved without crop loss with programmed irrigation and rates determined by instrumented measurements of rainfall and soil moisture conditions.

These results, and the programming information necessary to achieve them, have been widely disseminated throughout the state.

In 1979, a survey by the Nebraska Energy Office found that 1.8 million acres (25 percent) of the state's irrigated land) were programmed, saving \$26.9 million in direct energy costs and \$12 million in reduced percolation of nitrogen fertilizer into the aquifer for that year.

2. FORESTRY RESOURCES

Current activities: 2 percent of total Hatch funds for research. Forestry related research under Hatch is closely coordinated with the McIntire-Stennis Cooperative Forestry Research program which has similar research objectives. The Hatch forestry research program is characterized by a higher degree of multi-institutional or regional projects.

Selected examples of recent progress:

Air Drying Techniques to Control Surface Checking in Refractory Hardwoods. Scientists at North Carolina State University have developed and tested a method for drying oaks and other hard-to-dry lumber with greatly reduced surface checking and other degrading. Use of plywood sheets to slow the movement of moisture from the lumber surface could reduce the dollar loss for all hardwoods by one hundred million dollars annually.

Fertilization Nutrition of Southern Pine. Florida researchers have produced results showing how minimal preparation of forest sites for replanting can cut investments in fertilizers to replace harvested nutrients and reduce fuel use in site preparation. More complete harvesting of wood material and leaving a blanket of slash and forest floor material to protect mineral soil with slow release of nutrients resulted in 30 percent taller slash pines after 3 years.

Coniferous Tree Improvement in Minnesota. Minnesota is moving out of a period of forest surpluses. This is a threat to the State's forest products industry which contributes one billion dollars annually to the State's economy. Through research, genetically superior, more productive nursery stock for reforestation can be developed. Before superior trees can be planted or harvested, superior parental material must be identified, collected or developed and grown to sexual maturity in seed orchards.

Research has demonstrated that a five percent increment in growth rate is to be expected in the first improved generation with red pine, Minnesota's most widely planted species. Potential gains in other softwoods are even more impressive--10 to 11 percent with jack pine and 20 percent with white spruce. Additional increases in production are anticipated in the second and subsequent generations.

The acreage that will be reforested yearly in Minnesota is expected to increase from 18,500 acres to 55,000 acres by the year 2000. Most of this will be planted to red pine, jack pine, white spruce and black spruce. The State's forests could double their production with genetic improvement, tailoring the strain to the site, fertilization, better site preparation, and better control of competing vegetation.

3. CROPS RESOURCES

Current activities: 40 percent of total Hatch funds for research. Included under this research program grouping are crop protection and production systems for dependable and efficient production, quality improvement, quality maintenance, product development, and related commodity aspects of marketing of crops.

Selected examples of recent progress:

Wild Perennial Corn, an Exciting Gene Resource. A team of Ohio scientists is exploring the potential use of a wild relative of corn as a source of maize virus resistance for modern corn hybrids. Zea diploperennis, a previously unknown perennial "teosinte," was discovered in 1978 in the Sierra de Manantlan Mountains in Jalisco, Mexico. Preliminary studies by the Ohio scientists revealed that Zea diploperennis is resistant to major corn viruses, including maize chlorotic dwarf virus, maize chlorotic mottle virus, and maize streak virus. It also is tolerant to maize dwarf mosaic virus (strain B), maize rayado fino virus, and maize stripe virus. All of these virus diseases cause losses of varying seriousness in different maize (corn) production areas of the world. First crosses of Zea diploperennis are now being grown to see whether the resistance can be transferred and recovered. Potential resistance of the wild corn to such damaging insects as European cornborer, corn rootworm,

and cutworm is being examined. Genes for higher yields, improved nutritive quality, or greater root and stalk strength may be derived from Zea diploperennis. Because the wild corn is a perennial, scientists are looking at the remote possibility of developing a perennial corn hybrid sometime in the future. In its native habitat in Mexico, Zea diploperennis has very prolific vegetative growth. Thus, it has also created interest in its potential for production of biomass for fuel alcohol. It is estimated that it may take as long as 20 years of concentrated efforts to realize the full potential of Zea diploperennis, considered by many botanists as the missing link in the evolution of corn.

High Quality, Semidwarf Durum Wheat Varieties, a First. North Dakota State University (NDSU) in cooperation with SEA/AR has developed and released several new durum wheat varieties in recent years. Cando and Calvin are the first high quality, semidwarf durums produced in North America. The grain yield levels of these semidwarf durums have been equal to the highest yielding hard red spring wheats. These varieties will not shatter or lodge under the highest fertility and moisture conditions.

Edmore and Vic are the first NDSU durum varieties with high gluten strength. They will improve the export demand for U.S. durum since some countries prefer a durum which will produce a higher cooked pasta firmness. Edmore and Vic also are superior to all other durum varieties grown for kernel size, spaghetti color and resistance to the root-crown rot disease.

For each dollar invested in durum wheat breeding research at NDSU, approximately \$130 dividend is returned to North Dakota producers and for the State's economic benefit. The yield advantage of first Ward (1972) and later Botno, Rugby, Crosby (1973) and Cando (1975) over earlier varieties such as Leeds have netted nearly \$120 million additional income to North Dakota producers since their release. The first semidwarf varieties Cando and Calvin will bring additional financial benefits to North Dakota over even the more recent high yielding varieties while maintaining high levels of quality and disease resistance.

Sunflower Oil for Diesel Engines. Tests using sunflower oil as a fuel for diesel engines at North Dakota State University indicate that this energy alternative has a good potential for success. In the 1979 crop year, 3 1/2 million acres of sunflower were produced in the state. The hybrid varieties of sunflower that are grown have an oil content of about 40 percent. The energy in No. 2 diesel fuel is about 140,000 btu's per gallon, while the energy in sunflower oil is about 128,000 btu's per gallon.

Sunflower is yielding up to about 2,000 lb per acre in North Dakota. The average yield is about 1,400 lb per acre. At 1,400 lbs per acre, an oil yield of 73 gallons per acre is available. If three-fourths of the oil can be extracted on the farm, the yield would be about 55 gallons per acre. Fuel requirements for crop production are about 5-7 gallons per acre. The fuel from one acre of sunflower then could produce another 8-11 acres of crop. Emphasis in the research is being placed on the processing of the oil on farms or in community processing plants. This would provide a source of fuel that would be independent of the national transportation system. A small auger press being tested will extract 75 to 80 percent of the oil from the seed. A major part of the sediment can be removed from the oil by settling. Final filtration of the oil has yielded a product that will burn in a diesel engine. Short term tests with engines show that the sunflower oil can be blended with diesel fuel satisfactorily. One hundred percent sunflower oil is being used regularly as a fuel in the testing program.

Improving Potatoes by Cloning. Cloning techniques have been developed for regenerating single leaf cells of commercial potato varieties into complete

plants. The resultant plants, called protoclones, have been evaluated for superior horticultural, agronomic and disease resistance characters by a combination of laboratory and field tests. This is a cooperative project between the agricultural experiment stations of Kansas and North Dakota. Results of these studies have shown that all clones are not identical as expected but that a wide range of variability exists. Variation in vine morphology, tuber yield and composition, maturity, flowering and disease resistance have been observed. The results suggest that, for potatoes, cloning techniques offer a new means for generating variability for crop improvement. Increased yields and local adaptability are potential examples. Because the major problem in potato production is the control of several major diseases, identification and development of disease resistance in commercial varieties would not only reduce the necessity for chemical control, but reduce losses due to diseases, which are approximately 22% annually.

Selective Herbicide Applicators Developed. Research on selective applicators for applying herbicides to tall growing weed escapes in low growing crops were initiated in Nebraska in 1974 and introduced to Nebraska farmers in 1979 by weed scientists. These applicators are now being used on 1/3 of the soybean acreage in Nebraska. The applicators provide economical control of these weed escapes by applying the herbicide only to the weed. This results in a savings of 80 to 90% of the herbicide and provides a more economical, effective treatment than hand removal of weeds. Because of the use of selective applicators, several problem weeds such as shattercane and volunteer corn, which previously required expensive controls or dictated less profitable cropping sequences, can now be controlled effectively and economically in growing soybeans. This new weed control method is being researched for future use in sorghum, sugarbeets, field beans and other low growing crops.

Reducing Insect Pests on Soybeans. Entomologists at the Delaware Agricultural Experiment Station conducted tests with "trap" crops to draw insect pests away from primary crops. They have been highly successful in using snap beans as the "trap" crop for the Mexican bean beetle in Delaware soybean fields. The bean beetle apparently prefers snap beans to soybeans and concentrates its feeding as well as egg-laying on the snap beans when this plant is raised adjacent to soybeans. The amount of "trap" crop to achieve control is only about 1 percent of the primary crop, when it is planted in pure strips in rows either adjacent to or within the soybean field. In a commercial demonstration of the effectiveness of the snap bean being used as a "trap" crop, only 2 percent of the "trap" crop fields had to be sprayed for Mexican bean beetle, while 28 percent of the "untrapped" commercial fields were sprayed.

Unusually Sweet Sweetcorn Discovered at Illinois. Sweetness, tenderness, good texture (high water-soluble poly-saccharides-WSP) and low starch content are four earmarks of a high quality sweet corn. The two mutants most frequently used commercially for hybrid breeding are sugary (su) and shrunken-2 (sh2). The sh2 mutant is high in sugar content but low in WSP, resulting in a watery texture unsuitable for canning. The su mutant possesses appreciable amounts of WSP but lacks the high sugar levels of sh2 that many consumers desire in fresh market sweet corn. Recently scientists at the Illinois Agricultural Experiment Station discovered an inbred line of sweet corn, IL677a, that has a sugar content comparable to that of sh2 and a WSP content equal to the su genotype. The kernels of IL677a also appear to be much slower to dry in the field and have a distinctively lighter colored kernel. The gene responsible is from the su mutant and it has been tentatively named sugary enhancer, se. This modifier gene should be extremely useful in developing new sweet corn hybrids for fresh market and processing.

Seeding Rangeland. An experimental rangeland seeder developed by Texas Agricultural Experiment Station scientists offers a method of seeding rangeland where sparse to moderate brush debris is present following root plowing and

low cost smoothing for seedbed preparation. Moreover, the minimal land clearing required by this seeder increases the potential for improving brush infested rangeland by root plowing and reseeding with improved grasses.

Practical Planned Grazing Systems. Agronomists at the University of Nebraska have developed practical planned grazing systems for 4 million of the approximately 24 million acres of rangeland in Nebraska. The increased livestock production from these 4 million acres is valued at nearly \$12 million annually. In addition to increased returns, these planned grazing systems have improved the overall condition of the rangeland resource. The same researchers also have developed cultural and management practices for the integrated use of complementary forage crops (irrigated pasture, alfalfa, corn stalks, etc.) with rangeland. These alternatives, within the forage/livestock system, have given increased flexibility to the livestock producer in managing rangelands.

Identification of the Cause of Grass Tetany Disease in Cattle. At Louisiana State University Agricultural Experiment Station, agronomists have discovered that the often fatal disease of cattle known as grass tetany, or hypomagnesemia, is related to high levels of aluminum in forages. They have found that while many grasses and forages typically have from 10 to 50 parts per million (ppm) of aluminum in them, when various fertilizers are applied the level of aluminum of some forage and grass species may be raised to 2,000 to 4,000 ppm. Laboratory tests have shown that aluminum reduces the amount of magnesium and calcium in artificial cow's rumen. Since grass tetany is typified by low levels of magnesium and calcium in the blood, these findings should lead to new methods of combating this ailment.

4. ANIMAL RESOURCES

Current activities: 28 percent of total Hatch funds for research. Included under this research program grouping are protection, production and management aspects of beef and dairy cattle, swine, sheep, other animals, poultry, and aquaculture. It also includes quality improvement, product development, and related commodity aspects of marketing.

Selected examples of recent progress:

Riboflavin Deficiency and Reproductive Failure in Swine. A deficiency of the B-vitamin riboflavin in adult, female swine results in total disruption of the normal estrus cycle. This appears to result from an impairment of sex steroid metabolism in the deficient animals. These University of Illinois findings may have relevance to reproductive problems in other meat producing animals and in humans. To extend this new information to swine in a production environment, plans are underway to determine if estrus failure, often reported in swine under confinement, is related to the riboflavin status of the female. The vitamin will be measured by a new blood assay recently validated for swine by the Illinois scientists.

Improving Dairy Cattle Reproduction. Scientists at the University of Missouri have shown the effectiveness of growth hormone releasing factor (GnRH) in maintaining proper function of the ovaries in dairy cattle thus preventing the formation of cystic ovaries. This has served as a basis for Food and Drug Administration approval of the use of this compound by dairy cattle producers. This approval will have widespread economic impact upon the dairy cattle industry allowing greater breeding efficiency, thus increasing milk production.

Extra Genes Control Immunity in Chickens. Cornell University scientists have identified and bred chickens which have extra genes that control the important immune response mechanism. While ordinary chickens have two genes at each location on a pair of chromosomes, these chickens have three or more genes which are stable in the reproduction process. This permits selection for chickens that have outstanding ability to resist diseases. Studies are planned to

determine the diseases for which this protective mechanism is most effective. If this genetic means of controlling a variety of diseases proves useful, poultry producers will be spared the enormous costs involved in current disease control procedures using drugs.

Chicken and Turkey Semen Preservation. Artificial insemination is a standard practice in the reproduction of turkeys, and the practice has several applications in the chicken industry as well. While the preservation of semen from mammals has been well developed for years the storing of semen from birds has proven to be most difficult. University of California scientists have recently developed a process of freezing and storing chicken and turkey semen that allows reasonable fertility after storage of up to perhaps ten years. This process involves the use of glycerol as a protective agent and carefully controlled temperature especially between 5 and -40C. Use of this technique will allow turkey producers to house turkey toms on central stud farms isolated from hens and to collect semen at convenient times and ship it when and where needed. Presently toms must be located near the hens to permit use of the semen within a few minutes after collection.

Beef Cattle Selection. Scientists at Nebraska have continued to develop information on improvement of beef cattle through selection. Sire selection accounts for 80-90% of the selection differential seen in traits such as weaning weight, yearling weight and muscling (body shape and maturity). Such work serves as the basis for developing records of performance for beef improvement. Changes are small but when multiplied across the population of beef cattle become very significant.

Colostrum and Waste Milk to Dairy Calves. Several state agricultural experiment stations (including Pennsylvania and South Dakota) have shown that colostrum and/or milk from cows treated with antibiotics is satisfactory for feeding calves being grown for herd replacement. These products are unsatisfactory for use for human food and have been discarded as waste. As feed for calves, replacing milk and milk replacers, this represents a considerable saving in feed cost for each calf. In addition, the Pennsylvania workers have shown improved health of the digestive tract when colostrum was fed when compared to feeding milk replacers. All calves were given the usual dams colostrum during the first day of life. This work was done cooperatively on a Hatch Regional Project NC-119, Improving Large Dairy Herd Management Practices.

Infectious Bursal Disease (IBD) of Chickens - Effective Vaccine Evaluated. Scientists at Delaware Agricultural Experiment Station have evaluated the effectiveness of an inactivated infectious bursal disease (IBD) vaccine for meat-type and egg-type chicken breeders. The vaccine induces a high level of immunity over a prolonged period of the laying cycle. This immunity is passed on to the progeny. The young chicken is protected against IBD during the first few weeks of life and its immune competence is not compromised against a number of highly infectious diseases such as Newcastle disease and Marek's disease. The use of the inactivated IBD vaccine has had a positive effect on improved livability, more efficient weight gains and lowered condemnation rates. This improved efficiency of production is valued at \$30 million annually.

Selenium is Required for Laying Hens. Ohio State University researchers have demonstrated that the trace element selenium is required in the diet of laying hens that produce table eggs, just as it is for young chickens and hens that lay eggs for hatching purposes. Feedstuffs produced in much of the United States are low or borderline in selenium and FDA approval has been granted for feeds for young chicks and poult but not for layers. Generally soils in the Eastern United States are low in this element. The Ohio study has shown that the hen transforms much of the added inorganic selenite form of selenium into a bound form as a part of the protein of the egg. Egg production is increased by 10 to 15% by the addition of selenium to the ordinary corn-soybean diet.

produced in Ohio. This would increase income to egg producers in Ohio alone by \$9 to 15 million. The amount of increase will vary depending upon the amount contained in the feed ingredients which varies with the selenium content of soil.

5. PEOPLE, COMMUNITIES, AND INSTITUTIONS

Current activities: Equal to 12 percent of total Hatch funds for research. Included under this research program grouping are food and nutrition, food safety, rural development, and families and consumers.

Selected examples of recent progress:

Folic Acid Rich Diets Needed by Pregnant Women: Forty percent of a group of 269 pregnant low-income women were anemic at their first prenatal clinic visit and forty percent had low blood levels of folic acid (a B vitamin). Researchers at the University of Florida found that these same women had normal blood iron levels. Iron deficiency has generally been accepted as the most common cause of anemia in pregnant women. But these data indicate that folic acid deficiency may be more prevalent than iron deficiency in low-income pregnant women. Iron supplements given by physicians or iron-rich foods supplied in feeding programs will not solve the problem of anemia in these women. Rather, the need is for diets containing foods rich in folic acid.

Watching the Nutrients in Weight-Reduction Diets. Do the calorie-restricted diets of men and women who want to lose weight typically meet the needs for all other nutrients? Researchers at Iowa State University's Human Nutrition unit found that overweight women offered a planned low calorie diet, which met requirements for all the major nutrients, consumed less of two important (but infrequently determined) materials--zinc and potassium. Subjects, at the same time, were losing both zinc and potassium from their bodies, along with excess weight. Potassium is found in every cell, but its level in heart muscle appears critical. This research suggests that to avoid potential heart problems with low calorie diets, diet designers need to include low calorie foods rich in potassium.

Weed Hemicellulose Fiber Increases the "Good" Cholesterol. Continuing their research on the effect of dietary fiber on blood fats, researchers at the University of Nebraska-Lincoln found that the fiber component, hemicellulose, when added to the diets of normal human volunteers not only lowers serum triglycerides and total cholesterol, but increases serum HDL cholesterol - the "good" cholesterol. (Diets were low in fat and cholesterol.) Psyllium, a common weed, is the source of the hemicellulose. Higher circulating levels of HDL cholesterol have been associated with a lower risk of heart disease. These researchers also have shown that other types of dietary fiber, such as wheat bran, are not as effective in causing desirable changes as the hemicellulose component of plants. Continued research in this area suggests ways in which diet modification may increase life expectancy in the U.S. population.

Mineral - Dietary Fiber Interaction. Minerals in the diet have the potential for being bound by complexing with dietary fiber in the diet and, thus rendered unavailable for human absorption. Food scientists at the University of Massachusetts have studied the effect of pH and heat treatments on the binding of added food grade sources of calcium, magnesium, zinc and iron in the presence of a standard wheat bran, cellulose and legume. Metal binding was found to be pH dependant. Toasting had no effect on metal binding by cellulose, but had a significant effect on the binding of metals by legume and wheat bran. Boiling had a significant effect on the binding of metals by cellulose, legume and wheat bran.

Naturally Occurring Toxicants and "Toxicant Inhibitors" In Foods. Diets containing brassica (cabbage and cauliflower) were found to inhibit the carcinogenesis caused by aflatoxin in a rat model system. The inhibition

seems to be related to mixed function-oxidase inducers in these vegetables. Station scientists at the New York State Agricultural Experiment Station, Geneva, have found a consistent diminution in the occurrence of carcinomas in the livers of rats fed the powerful carcinogenic substance, aflatoxin, a mycotoxin developed by mold in certain food products. The cancer inhibiting diets contained 20% of either cauliflower or cabbage on a dry weight basis.

Glycoalkaloids Occurring in Potato Tubers. The glycoalkaloids naturally occurring in potato tubers have been associated with bitter taste, objectionable off-flavor, inhibition of cholinesterase, and poisoning in humans and animals. Since hollow heart and blackheart are very common spoilage disorders of potatoes grown anywhere in the world, food scientists at Utah State University initiated studies to determine if potato tubers having the non-parasite disorders of hollow heart and blackheart contained significantly more glycoalkaloids in the cortical region than normal tubers. Potato tubers with the disorders contained significantly more glycoalkaloids than normal tubers and the glycoalkaloid content of the tuber tissue was found to be related to severity of the disorders.

Quality Maintenance In Marketing and Storage of Vegetables. Maryland Agricultural Experiment Station researchers have developed a new energy-saving method of packaging fresh vegetables. The method has been named GASPAK and preserves the fresh-like quality and taste of foods for several months without the use of refrigeration. To preserve the food, gases, such as carbon dioxide, are pumped into food-filled plastic packages, creating a miniature controlled environment which retards spoilage. Preservation is accomplished using about one-fourth the energy costs required for canning and freezing.

Ultrastructure of Foods and Food Ingredients. Soy proteins have not been used to manufacture imitation mozzarella cheese due to their stretching properties. Through careful study of the ultrastructure of the soy proteins and skillful use of appropriate ingredients, food scientists at the University of Illinois have been able to develop food types with the desired stretching and stringing characteristics. These basic studies have led to a breakthrough in degree of control over the rheological properties of cheese foods and represents a major step forward in cheese technology and soybean utilization.

Discovery of a New Muscle Protein. A new protein component (desmin) of the muscle cell cytoskeleton has been identified by Iowa State University scientists. Desmin, a 55,000 - dalton protein component of the intermediate cellular filaments, has been purified from both swine striated and poultry smooth muscles. Antibodies to the new protein have been used in immunofluorescence and immunolectron microscope localization studies and have demonstrated that desmin is located at the periphery of skeletal muscle z-lines. This protein apparently plays an important role in tying together all the long protein strands inside of muscle cells which are responsible for muscle contraction in the living animal and for many of the desirable nutritious and palatability characteristics of meat. Degradation of desmin after death is associated with a loss of cellular integrity which has a profound effect on meat tenderness (important in fresh meats), on water-holding capacity of muscle (important in both fresh and processed meats), and on the emulsification and binding properties of muscle components (important in processed meats).

Microwave cooking maintains vitamin content of foods. A commercial oven manufacturer claims to be "changing the way America cooks" by introducing microwave oven convenience. Nutrition-conscious consumers, who are attracted to the convenience will be reassured by research conducted at the University of Illinois Experiment Station which shows that cooking meat and fresh or frozen vegetables in microwave ovens results in the same levels of important B vitamins, folacin and thiamin, as well as vitamin C, as compared to the

same products cooked in the conventional manner. However, claims for superior retention of these vitamins in microwave cooking procedures were not substantiated by this research.

Solar Energy. Scientists at the Wisconsin Agricultural Experiment Station showed that solar energy collection, storage, and supply are compatible with energy demands for a fluid milk processing plant. Solar energy can supply up to 34 percent of the processing energy demand but the economic climate must change markedly for the system to be economically feasible.

Energy Conservation and Objective Measurement of Meat Quality. Research at the University of Missouri is concerned with conservation of energy and the influence of nitrite on flavor of processed meats. Results of sensory evaluation and rapid-direct sampling gas-liquid-chromatography-mass spectrometry indicate that meat from beef fed grass is less desirable than that of animals fed corn grain or corn silage. Flavor volatiles believed responsible for undesirable flavor of grass fed beef include: hydrocarbons, esters, aldehydes, and lactones. These volatiles decrease in concentration and flavor is improved by feeding cattle corn for at least six weeks prior to slaughter. Cattle fed corn silage produced USDA good grade carcasses and meat that was as acceptable as meat from carcasses of animals fed to USDA choice grade with corn.

The instrumental procedure for measuring flavor volatiles will ultimately replace sensory analysis as a measure of flavor desirability and is being used to study undesirable volatiles formed during storage of nitrite-free cooked meats. This serves as a method of evaluating the influence of other additives being used to replace nitrite as a cured meat preservative.

National County Data Base Aids Demographic Research. Demographic researchers throughout the U.S. have benefited from access to a unified system of socio-demographic county data for 1947 to 1978 developed by collaborating sociologists at Montana State University and Washington State University. Among the important research projects using these data have been analyses of the population turnaround in rural America. This research has demonstrated that urban to rural migrants have been able to gain their preferred residential life style without sacrificing employment or income. Results have shown that the population turnaround was accompanied by a deconcentration of employment in most major industry groups. This information is important for national and regional-level rural development policy making and for program administration in both growing and declining areas.

6. COMPETITION, TRADE ADJUSTMENTS, PRICE AND INCOME POLICY

Current activities: 7 percent of total Hatch funds for research. Included under this research program grouping are farm adjustments, prices and income, economic aspects of marketing and competition.

Selected examples of recent progress:

Effects of Increased Consumption of Ground Beef on the Beef Industry. The increasing demand for ground beef can be met by converting less expensive cuts of meat or by developing "growing-out" programs that would produce lean beef carcasses which could be used exclusively for ground beef. Researchers at Mississippi State University have concluded that the "growing-out" alternative would not be economically appealing to a significant number of beef producers in the Southeastern United States. The ground beef trade can thus be expected to convert an increasing amount of fed beef primals, principally rounds and chucks to ground beef. This information will be useful to ranchers and beef processors in planning and investing in their enterprises.

Underdevelopment of U.S. Agriculture. This research effort at the University of Georgia developed an econometric model that quantified the linkages between the agricultural and non-agricultural sectors of state and sub-state economies. One of the key conclusions is that a majority of the states are over-industrialized and underdeveloped in agriculture. Increases in agriculture will have a larger impact on personal incomes than would equivalent dollar increases in the production of other basic industries. Therefore policies to encourage the expansion of agriculture would have a greater impact on the economy than would similar policies relating to increased industrialization.

Effects of Alternative Gasohol Programs. Researchers at Purdue University found that alcohol production from grains in amounts below 2 billion gallons would not result in serious dislocations in the U.S. agricultural sector. However, the diversion of grain for higher levels of production of alcohol would cause corn prices to rise significantly, exports to decline, and government expenditures to increase greatly. Research such as this is important in assessing the impacts of alternative public policies.

COOPERATIVE FORESTRY RESEARCH

The Cooperative Forestry Research (McIntire-Stennis) program is planned and directed to provide answers to the complex questions that face forest land managers seeking to produce an adequate timber supply for home and other uses. Timber production and wood utilization and distribution systems are key elements of forestry research. The research also meets the demands for wildlife production and recreational opportunity on forests, and assures an acceptable level of environmental quality in all forest operations and uses.

Following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: The following research program activities encompass the range of research funded under this act:

Multi-resource inventory, appraisal and evaluation. Assessment of supply, growth and demand, new inventory methods, alternative and multiple uses, economic and social benefits.

Forest resource management. Land productivity and forest growth, reproduction of trees and stands, improved varieties, institutional regulations and forest management.

Forest protection. Systems for detecting and evaluating losses to insects and disease; control methods; fire detection, monitoring, and control.

Harvesting, processing, marketing. Energy efficient equipment; environmental concerns; wood properties and uses; biomass for energy; rural development role of forests and forest industry.

Forest watersheds, soils, pollution. Quality, quantity water production; effects of forest management on nutrient cycling, water quality and productivity; effects of sewage disposal; air quality effects, amelioration of air and noise pollution.

Forest range, wildlife, fisheries habitat. Use and effects of grazing, forest-range management, wildlife habitat maintenance, costs and benefits.

Forest recreation and environmental values. Recreation opportunity expansion methods; demand, cost and benefit analyses; environmental quality improvement; effects on forest environment.

Selected examples of recent progress:

Pulp Mill Wastes. Research in wood chemistry at the Department of Forest Products, Virginia Polytechnic Institute and State University has resulted in developing methods to convert pulp mill wastes into a high quality polyurethane. The new polyurethane has all the qualities of that made from a petroleum base; yet, its basic raw material is a waste product available potentially in a quantity of more than 50,000 tons per year in the U.S. The method of producing polyurethane from pulp mill waste has attracted keen interest from industry which can use the new polyurethane to manufacture foams, adhesives and finishes. Potential oil savings amount, conservatively, to 1,000,000 barrels per year using current waste products.

Selection and Breeding of Eastern Hardwoods. In Ohio researchers concentrating on one of the more important hardwood species in the East, yellow-poplar, have crossed native trees with those from widely separated areas. These hybrid families, after 2 years of test plantings, are growing 40 to 60 percent faster than Ohio yellow-poplar families produced by natural insect pollination. In view of the Nation's increasing needs for viable alternatives to Western softwoods in construction, this breakthrough is of great potential significance in its impact in providing for America's long-term housing needs.

Physiology of Pollution in Relation to Growth and Regeneration of Forest Trees. The Department of Forestry at the University of Wisconsin has made significant contributions toward a basic understanding of the growth and metabolism of young forest trees as related to air pollution. Great variability was found between and within species to air pollutants (SO_2 , ozone). Susceptibility to air pollutants varied with tree age and leaf anatomy, especially the size and frequency of leaf pores (stomata) through which air pollutants are absorbed. Susceptibility to air pollutants also varied greatly with prevailing light, temperature, and humidity conditions. In some species, resistance to air pollution was the result of avoiding uptake of air pollutants (small and few stomatal pores); in other species, pollution resistance was associated with biochemical tolerance of pollutants. These studies provided necessary information for selecting and breeding pollution-resistant trees, a significant step in avoiding plant stress and subsequent widespread loss of trees to insects and disease such as Dutch Elm Disease.

Nitrogen Stress and Insect Attack in Lodgepole Pine Forest. Lodgepole pine, which covers approximately 13 million acres in the West, is only nominally considered when forest planners seek ways to provide logs to mills over the next 20-30 years--a period which most agree will be a period of shortage of sawtimber size softwood trees in the area. In large measure, low species priority is due to mountain pine beetle susceptibility as vigor decreases with age. Researchers at Oregon State University have found that even old trees of this species respond to nitrogen fertilization with 25-30 percent increase in diameter growth, and a reduction in beetle attack by approximately 80 percent. This implies that it may be possible to develop in the short term merchantable trees from many trees formerly used only for pulp. Based on the conservative estimate that treatment would cost \$40 per acre, and the increase in value would be \$80 per acre, treating only 1/4 of the acreage would add some \$130,000,000 in stumpage values alone.

Shelterbelt Diseases. Using planting stock grown from cuttings, cottonwood and hybrid poplar (*Populus* species) are planted extensively in the northern Great Plains for field and farmstead shelterbelts. A major limiting factor in producing planting stock is "Blackstem", a necrosis of the bark caused by parasitic fungi. A forest nursery manager, able to supply only half of his needs in 1977 and having sustained average annual losses of 35 percent for 10 years, brought the problem to the attention of researchers at North Dakota State University. The researchers developed a procedure for soaking the cuttings in a fungicide before winter storage, which led to increased production of usable cottonwood planting stock with little or no additional cost to the nursery. Based on the research costs of \$6,000 (\$3,000 for 2 years) the project had a benefit/cost ratio of 8.3.

Interrelations of Forest, Water and Climate. Disposal of untreated municipal wastewater poses a problem for many small municipalities. Many studies have related to efficient sewage disposal through dispersing such effluent in the forest. University of Georgia scientists have found that, after dispersing wastewater at a rate of 7.6 cm./week on a mountain forest slope, groundwater nitrate levels have increased but still meet drinking water

standards. Disposal of untreated sewage wastewater in forests appears to offer a practical, inexpensive alternative for small mountain municipalities.

Foliar Fertilization and Mycorrhizal Development. Improving seedling growth by enhancing mycorrhizal colonization of the root system through foliar fertilization is being evaluated. Mycorrhizae are symbiotic associations in which a plant's secondary root system is invaded by specific beneficial fungi during periods of active growth. Soil applications of fertilizers, in particular nitrogen and phosphorus, frequently inhibit mycorrhizal development. Other recognized disadvantages of excessive soil fertilization are high cost, both in energy and in dollars, and environmental degradation.

Light applications of certain foliar fertilizer combinations (nitrogen, phosphorus, potassium) and (nitrogen, magnesium) significantly influence ectomycorrhizal development. Growth of oak and pine seedlings inoculated with Pisolithus tinctorius, a known mycorrhizae former, yielded 40 percent greater colonization with mycorrhizae than root systems of similar seedlings receiving soil-applied fertilizers. This increase in colonization resulted in increases of as much as 200 percent in dry weight yield, 118 percent in height and 75 percent in diameter. Foliar misting with the proper combination and balance of fertilizers may offer the opportunity for significant improvement in the growth and development of mycorrhizal plants.

1890 COLLEGES AND TUSKEGEE INSTITUTE

The research program at the 1890 Colleges and Tuskegee Institute places emphasis in the areas of human nutrition, rural development and quality of living, and limited resource farming.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: During the period from 1967 through 1978, the 1890 Colleges and Tuskegee Institute were receiving funds for research under the authority of Public Law 89-106, which gives grant authority for awards up to 5 years. The grant authority had limitations that created difficulties in the development of a continuing agricultural research program. Generally there was a lack of flexibility in the handling of unforeseen problems that could occur in a research program. At the present time, there are 246 active Public Law 89-106, 5-year research grants that support research projects being conducted at these institutions. The existing grants will be carried through to termination by the end of fiscal year 1983. The grants program will continue to be supervised to completion in the usual manner through administrative reviews, special reviews, and the submission of annual progress reports.

A formula funded research program for the 1890 Colleges and Tuskegee Institute was established in the Food and Agriculture Act of 1977. Section 1445 authorized annual appropriations to support continuing agricultural research at the 1890 Colleges and Tuskegee Institute and funds were appropriated in 1980 to continue this program of research.

Guidance from the agency has been provided to institutions in the implementation of the formula funded program. This assistance has been in the form of workshops, conferences, development of administrative guideline manuals, and individual campus visits. The implementation has gone very well. All the comprehensive State plans for the research coordinated under this new authorization for these 17 institutions and under the Hatch Act for the sister 1862 land-grant universities in the same States were completed and approved by SEA.

During the second year of operation with funds appropriated under Section 1445, the institutions allocated funds to support new and on-going research projects under their on-going Public Law 89-106 grant supported research programs and for the renovation of some research laboratories.

The research projects currently being conducted in the 1890 Colleges and Tuskegee Institute are distributed into several research programs as follows: natural resources 11 percent; crops resources, 27 percent; animal resources, 22 percent; people, communities and institutions, 35 percent; and competition, trade adjustments, price and income policy, 5 percent.

Selected examples of recent progress:

Home Insulation Pays Off for Low-Income Families: Data from Kentucky State University indicates that low-income households can conserve both energy and money through home insulation. House size was found to vary directly with income. However, the amount of insulation needed varied inversely with level of income. Houses of low-income families need more insulation than those of high-income families to meet minimum standards. The savings in energy and, subsequently, in money from this conservation measure can be considerable. These findings have implications for public policy makers concerning the advisability of low interest loans to low-income families to encourage conservation through home insulation.

Hair Zinc Level Linked to Control of Diabetes. Research findings in experiments with rats at Lincoln University, Missouri, indicate that zinc levels in blood and hair are related to the degree to which an animal with diabetes responds to treatment. Interest is high in using a simple technique (zinc determination) in a material (hair) that is easily available for sampling. Eventually, it is hoped, that if human subjects have similar responses, this technique will be a useful indicator of the process of diabetes treatment in humans.

Environmental Toxins Related to Intelligence. Findings at the University of Maryland Eastern Shore Experiment Station indicate that environmental toxins (lead and cadmium) are related to intelligence. According to the study, the higher the level of lead and cadmium in the diet, the lower the level of intelligence. Using an electrophysiological assessment tool, researchers identified direct linkage between cadmium presence and verbal skills; and lead presence and performance skills. The findings of the study impact particularly on nutrition practices during prenatal and post natal periods when major brain development occurs. The study can lead to more effective diagnostic and remedial procedures to aid children with learning disabilities.

Low-Income Families See Clothing as Greatest Need. Alcorn State University researchers found that sixty percent of the families in southwest Mississippi counties who ranked clothing high on their human needs list had incomes of less than \$6,000 per year. Overall, one-third of all families interviewed gave clothing needs top priority. Cost-saving techniques to help families make and repair their own clothes were developed and tested. These techniques are easily absorbed into low-income budgets, allowing people with limited income to meet other basic human needs.

Rainbow Trout and Catfish Farming. Scientists at the University of Arkansas, Pine Bluff, have produced rainbow trout in catfish ponds during the colder periods of the year. Double cropping was used with catfish in the summer and trout in the winter. Trout did well either alone or with catfish. Trout even stimulated winter feeding by the catfish. Stocking with 2,000 trout per acre resulted in net income yields of about \$500 per acre.

Achieving Higher Vegetable Yields. In experiments at Tuskegee Institute during 1979, mulched tomatoes yielded 65 to 80 percent more fruit than unmulched plants. Direct seeded tomato plants bore fruit 15 days earlier than transplanted tomatoes. Direct seeding also appears to be beneficial for peppers and eggplants.

In another study, drip irrigation increased yields of egg plants, okra, peppers, and squash by up to 140 percent over unirrigated plants.

These experiments indicate that in Alabama's climate, it is advantageous to irrigate, mulch, and plant certain vegetables directly from seed.

SPECIAL RESEARCH GRANTS

The Special Research Grants program concentrates on problems of national interest beyond the normal emphasis in the formula grant program.

Following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: In fiscal year 1981 under the Special Research Grants program, grants will be made to the four regional leader laboratories and the headquarters laboratory to continue the pesticide clearance research program (New York, Michigan, Florida, California, New Jersey) and to continue the on-going pesticide impact assessment program. Each of the agricultural experiment stations in Idaho, Oregon, and Washington will receive a grant to continue the research on soil erosion supported under this authorization. A grant involving 16 states also will be made to continue the program of research in food and agriculture policies.

Included under the Special Research Grants program are grants for alcohol fuels authorized by Section 1419 of Public Law 95-113 and Native Latex grants authorized by Public Law 95-592.

In fiscal year 1981 Special Research Grants will be awarded competitively, utilizing peer panels of scientists to evaluate the scientific merit of proposals in the areas of energy, animal health, integrated pest management, aquaculture, antidesertification, germplasm resources, native latex and, alcohol fuels research. Solicitation of applications for fiscal year 1981 grants to be awarded competitively will be published in the Federal Register. It is anticipated that grants will be awarded by August 1981.

One hundred and thirteen Special Research Grants were awarded competitively in fiscal year 1980. Given below are details on the number of proposals submitted and the number of grants for each area.

Specific Area of Inquiry	Number of Preproposals Submitted	Annual Request	Number of Grants Awarded	Total Amount of Awards
P. L. 89-106:				
Soybeans	41	\$3,620,476	6	\$485,000
Energy	94	8,529,262	23	1,843,000
Animal Health				
Infectious Diseases	247	31,663,871	48	4,408,833
Parasites	49	5,761,078	9	1,166,870
Noninfectious Diseases and Predator Losses	56	7,086,025	13	1,214,297
P. L. 95-113:				
Alcohol fuels	31	2,773,597	5	485,000
P. L. 95-592				
Native Latex	31	6,118,558	9	630,500

Selected examples of recent progress:

Physiological Stress Effects on Nitrogen Assimilation in Soybeans. Studies suggest that inhibition of nodule activity observed under long term stress is not caused solely by the decreased carbon dioxide (CO_2) exchange rate (CER), but also by changes in photosynthetic pool sizes. Agronomists at the University of Minnesota studied the $^{14}\text{CO}_2$ assimilation, photosynthetic distribution, stomatal resistance, and acetylene reduction of vegetative 'Clay' soybean plants, 3 hours after the leaves had been pulse labelled with $^{14}\text{CO}_2$. While monitoring the photosynthetic (CER) and acetylene reduction activity of control and water stressed soybean plants, they found that $^{14}\text{CO}_2$ assimilation and specific nodule activity was decreased and stomatal resistance was increased following 6 hours of water stress induced by polyethylene glycol. They also found that dry weights of beans, of stems, and petioles, and of nodules were significantly decreased in the water stress treatments while root dry weights were increased. Water stress also resulted in a redistributing of ^{14}C being translocated to the roots and nodules at the expense of the leaves.

New Pesticide Clearances Aid Producers of Minor Crops. Pesticide field studies and chemical residue analyses conducted in research laboratories in California, Florida, Michigan, New Jersey and New York, with input from the states and U.S. territories, resulted in the establishment of twenty-two tolerances for food crops and 841 new registrations on ornamental plantings. These clearances have provided needed new chemical tools for control of serious pests for which no previous registered alternatives existed. This increases production while lowering costs.

Freezing Plant Tissue for Future Use. Work in progress at the University of Arizona indicates it may be possible to deep freeze and later use isolated and cultured plant cells, buds, and other regenerative tissue of asexually propagated plants. Special interest is directed toward flowers, fruit trees, and some vegetables. Methodologies developed under this special grant should be applicable to a wide range of crops and other plants that traditionally are not propagated by seed.

Trucking Regulations for Hauling Soybean Meal. Economists at North Carolina State University concluded that the proposal by Congress and by the Rural Transportation Advisory Task Force to reclassify soybean meal as an exempt commodity for trucking would save from 48,000 to 56,000 gallons of fuel per year in North Carolina alone. Additional cost savings would result in a total annual saving of \$1.5 to \$1.7 million per year. Most of these savings would be passed on to soybean producers and consumers of poultry and livestock products. This research is useful in the consideration of intra-state as well as inter-state transportation regulations.

Disease-Infected Plant Tissue Makes Poor Feed. Research at the University of Missouri shows that stem rust of orchardgrass not only reduces forage yield but also adversely affect the quality of the forage. Microscopic examination showed no apparent *in vitro* digestion of tissue when mycelium was evident; and only partial digestion of adjacent tissues with no mycelium.

Worker Exposure to Dimethoate, Trichlorfon, Carbaryl, and Chlorobenzilate. Researchers at the University of California at Riverside have determined the potential exposure of agricultural workers to four major insecticides applied to orange and lemon trees and under consideration by EPA for reregistration. The potential exposure was measured by a new technique of examining leaves for dislodgable residues which can be removed from leaves by shaking them in a detergent solution. Residues were monitored for 61 days following insecticide application. Carbaryl was the most persistent insecticide of the four; trichlorfon and dimethoate were the least persistent. Edible portions of fruit were examined for residues 60 days after insecticide application, and no analytically significant residues were found.

Energy-Efficient Production of Anhydrous Ethanol. One of the barriers to more widespread use of gasohol as a fuel is the production of an essentially anhydrous ethanol. Studies underway at Purdue University indicate that a process using a mixture consisting primarily of cornmeal as an absorption agent is 25 times more energy efficient in producing anhydrous ethanol than previously tested methods.

Mycoplasma Mastitis Studies in Dairy Cattle. California scientists have underway an extensive study of mycoplasma mastitis of dairy cattle. This form of mastitis spreads rapidly through a herd with serious consequences. Objectives of the research are concentrated on developing immunization programs, effective preventive therapy, and learning how the disease spreads on the farm and between farms. The epidemiologic study involves 235 herds (100,000 cows) in Tulare County. It is anticipated that these studies will provide information that may lead to control of the disease. Mastitis is one of the greatest economic problems facing the dairy industry and is estimated to cost the industry more than \$1 billion annually.

Liver Flukes - Control by Vaccination. Scientists at the Idaho Agricultural Experiment Station reported that an experimental vaccine for Fasciola hepatica, liver flukes infection, has been developed, with preliminary tests showing fluke reduction of greater than 90 percent. Common liver fluke infection is a world-wide problem and a highly important economic infection in range cattle and sheep in many States. Current control programs relate to pasture management and treatment designed for infected animals. The experimental work holds promise for developing a preventive vaccination program that may have broad implications in the control of liver flukes.

Bovine Pulmonary Emphysema - Reproduced by Changes in Grazing Conditions. Oregon scientists have underway a two-year study on acute bovine pulmonary emphysema. They have been able to reproduce the disease (ABPE) by simulating natural grazing conditions. The disease was produced by abruptly changing cattle from an insufficient diet of green, closely clipped pasture to a lush well-irrigated pasture. By subjecting cattle to the simulated grazing regimen, 3-methyindole level were increased and a drop of pH occurred in the rumen. Lush pastures are rich in indole acetic acid which by action of rumen bacteria is converted to 3-methyindole. This compound had been found previously to produce the disease by dosing cattle with 3-methyindole or tryptophan. These findings are expected to furnish a basis for a management program that would prevent ABPE.

Bovine Respiratory Disease - Effect of BVD Virus. Tennessee scientists have a three-year project in progress on the effect of bovine viral diarrhea (BVD) agent on respiratory tract and immune response of the lungs. Animal models have been developed and studies are underway to evaluate the basic immune response of the cells and tissues of the lungs. Two tests are being studied to identify the immune response. IgG and IgA, but not IgM, were present in the lung fluids. The identification of the immune substances will lead to methods of enhancing this protective response. The Enzyme Linked Immunosorbent Assay test was found to be a sensitive specific test for BVD antibodies. This finding will aid in developing effective vaccines. Respiratory disease problems of cattle costs the cattle industry \$3 billion loss each year. The studies at Tennessee and other states will help the industry reduce these losses.

Identifying Disease Resistant Cattle. Wisconsin scientists have initiated basic studies to identify cattle having superior genetic resistance to diseases and parasites. These scientists are examining specific segments of cattle chromosomes to find genetic markers which will permit accurate identification of individual animals that are highly resistant to specific diseases. The chromosome segments under study control the specific kinds and amounts of

disease fighting cells and substances that each animal mobilizes to counter disease agents. Success in this research will permit selection and breeding of animals highly resistant to disease agents and provide an effective means of reducing the estimated \$12 billion annual loss that results from illness and death of livestock and poultry in food animal production.

Cattle Parasites - Studies Initiated on Potential Vaccines. Virginia scientists have initiated a three year study on (Ostertag) common intestinal parasite of cattle and sheep. The objectives of this study are to determine how to enhance the response of cattle and sheep to the parasite toxin and characterization of this toxin. Preliminary studies indicate the parasite toxin depresses the gastric cell function. The research is involved in purifying and characterizing this toxin, which may lead to developing an immunizing agent. Currently, the only approach to the control of the parasite is pasture management and use of worm medication. The programs have kept these intestinal infections at a manageable level, but have not eliminated the constant use of medication. Parasitic infection and the medication program costs the cattle and sheep industries millions of dollars each year.

COMPETITIVE RESEARCH GRANTS

The program of Competitive Research Grants was initiated to fund basic research in selected high priority areas related to food production and human nutrition. The competitive grants complement the on-going research efforts of the USDA and the traditional agricultural research community by obtaining the participation of research scientists throughout the entire U.S. scientific community who have outstanding expertise in these and related areas. The Competitive Research Grants program reflects the Congressional intent of the Food and Agriculture Act of 1977.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: Five targeted areas were identified as possessing great opportunities for scientific discoveries and for contributing to applied research vitally needed on important food problems. There are four target areas relating to crop productivity: photosynthesis, biological nitrogen-fixation, genetic mechanisms for crop improvement, and plant protection from biological stresses (e.g., insects, pathogens, viruses, and nematodes). The target area in human nutrition relates to establishing human nutrient requirements.

The Competitive Research Grants Office received 598 research proposals in FY 1980 requesting about \$100 million for support of research in the targeted areas. From these proposals, 206 grants were made in the areas, for the amounts, and to the types of research organizations noted below. Approximately 29 percent of the research proposals, which were evaluated by ad hoc and peer panel reviewers and competitive research grants office scientists to represent good to excellent science related to the mission of this program, were funded.

Given below are details on the number of proposals submitted, the number of grants awarded and the major categories of grantee organizations.

	<u>Proposals Received</u>	<u>Dollars Requested</u>	<u>Grants Awarded</u>	<u>Dollars Awarded</u>
Plant Biology				
Biological Stress	205	\$29,373,000	60	\$ 3,298,000
Genetic Mechanisms	103	16,975,000	44	3,298,000
Nitrogen Fixation	83	16,080,000	33	2,813,000
Photosynthesis	100	15,821,000	41	2,813,000
Subtotal	491	\$78,249,000	178	\$12,222,000
Human Nutrition				
Nutrient Requirements	107	<u>21,433,000</u>	<u>28</u>	<u>2,813,000</u>
TOTAL	598	\$99,682,000	206	\$15,035,000
	<u>Proposals Received</u>	<u>Dollars Requested</u>	<u>Grants Awarded</u>	<u>Dollars Awarded</u>
Land-Grant Universities				
SAES	391	\$61,792,000	119	\$ 8,281,775
Non-SAES	(319)	(50,391,000)	(93)	(6,307,775)
Private Universities	(72)	(11,401,000)	(26)	(1,974,000)
Other Public Universities	53	11,893,000	32	2,582,000
Federal Laboratories	90	13,833,000	30	2,105,000
USDA/SEA	2	518,000	2	136,650
Private Non-Profit	28	4,186,000	12	872,575
Private Profit	31	6,674,000	10	867,000
State and Local Agencies	2	784,000	1	190,000
	<u>1</u>	<u>2,000</u>	<u>0</u>	<u>0</u>
TOTAL	598	99,682,000	206	\$15,035,000

Selected examples of recent progress:

Nature and Organization of Polygenic Control of a Metric Trait: Seeds serve as an important source of food for humans and livestock. Work is underway in a number of laboratories across the country to understand more about seed storage proteins, how they are inherited, and how amounts of different proteins can be manipulated giving a more favorable balance of essential amino acids in proteins. Using a common bean, Phaseolus vulgaris L., studies at The University of Wisconsin-Madison have shown that variation in seed protein concentration and the major protein fraction, globulin-1 (G-1), is in part under genetic control. The investigator recently identified a major genetic factor showing positive regulation of the quantitative expression of G-1 protein and the regulation of other seed components. In one experimental population it was found that an increase in seed size resulted from an increase in the amount of protein rather than of carbohydrates. The results thus far are particularly encouraging in the experimental population with yields equal to or better than the original parent line showing that high percentage protein is not merely a function of low seed yield.

Nitrogen Fixation in Blue-Green Algae (Cyanobacteria). Nitrogenase is the enzyme which converts atmospheric nitrogen to ammonia, a compound which can then be utilized for the synthesis of plant proteins. An investigator at the University of Chicago has sequenced the basic coding for one of the major components of the nitrogenase complex in the blue-green alga, Anabaena. The heterocyst in which the fixation reaction occurs is a modified algal cell in which the oxygen evolving system has been minimized. This DNA sequencing of nitrogenase reductase has been completed and has allowed for the prediction of the amino acid sequence in the enzyme protein. The ultimate goal of this research would be to transfer the genes coding for the fixation of nitrogen to those plants which do not naturally possess them. This sequencing is a first for a cell type of this complexity and also for an organism in which nitrogen fixation is so closely associated with photosynthesis.

Investigation on the Role of Zinc in the Human Diet. Investigators at Virginia Polytechnic Institute and State University have provided new insights into the human need for zinc and the hazards of inadequate zinc intake. Administration of therapeutic levels of steroids to rats has been found to cause shifts in cellular zinc, leading to depletion in some tissues and accumulation in others. Interactions have also been discovered between sugar-regulating hormones and tissue zinc. In another study, lack of dietary zinc has been found to increase the body's requirement for vitamin E. This may be especially important in explaining the role of zinc in pregnancy and childbirth. Clinical studies with zinc at Tulane University and the Universities of Colorado and California have provided further support for the possibility that dietary zinc may be submarginal in certain population groups (e.g., children and pregnant women).

Photosynthetic Adaptation of Desert Annuals to Temperature and Light. Many areas of the Southwest are too dry or too hot for production of agricultural crops, but some native plant species thrive there. An investigator at the Carnegie Institution in California is studying how these plants adapt to extreme environments. A new technique has been developed for measuring photosynthesis of plants growing in their native habitat. These species have also been studied under controlled conditions in the lab. Some of the arid land plants are extraordinarily efficient during the short period when conditions are relatively favorable for growth. Other species adapt to high temperature by changing the optimum temperature for photosynthesis. The change involved a change in the lipids of the membranes and the rate at which key biochemical reactions occur.

Specificity of Plant-Microbe Interactions. A primary goal in plant pathology is to understand the molecular interaction between the pathogen, a cause of disease, and the host. A scientist at Utah State University is studying the interaction between beans and Pseudomonas bacteria. While one species of Pseudomonas has evolved to be pathogenic on beans, others lack this ability and exist as organisms living on dead or decaying organic matter. This research has investigated the defense mechanisms plants use to limit the spread and development of avirulent or non-pathogenic strains of Pseudomonas. Research has focused on the concept that plant cell walls produce substances that trap and immobilize avirulent bacteria in a matrix. These substances, or agglutinins as they are called, are produced as a result of recognition of the bacteria by the plant. The structure of agglutinins and their relation to normal wall components is an area of active study. Components of bacterial cell walls play a key role in determining whether or not the bacterium is pathogenic or avirulent. The compounds responsible for pathogenicity are under investigation and their structure and function is also an area of study. The research will provide information on the molecular events that govern the specificity of interaction of beans with pseudomonads and will indicate generalities in the mechanisms by which plants defend themselves from microbial challenges.

Sequencing Nitrogenase Genes from Rhizobium Meliloti and Klebsiella Pneumoniae. Nitrogenase is the enzyme which catalyzes the conversion of molecular nitrogen to ammonia in nitrogen-fixing bacteria with the subsequent production of amino acids that the host plant requires. A Harvard geneticist has developed a method for accurately determining the location of mutations on the chromosomal fragment which contains the genes for the structure of nitrogenase. This method has been used to construct a detailed physical map of the nitrogen fixation gene cluster of the bacterium, Klebsiella pneumoniae. Comparisons are now being made between the nucleotide sequences of the structural genes for nitrogenase from this bacterium with that from one involved in symbiotic relationship with alfalfa. Various genetic manipulations that can be made using this method would make it possible to 1) determine the amino acid sequences of the two different components of nitrogenase, 2) study

the mechanism of action of this important enzyme by construction mutants with lesions at specific amino acids and 3) locate regions on the gene that are involved in enzyme control.

Carnitine Content of Foods Consumed in the United States. Carnitine is an absolute requirement for production of energy from fat. Although the infant's diet contains a large number of fat calories the infant does not appear to have a fully developed capability for synthesizing carnitine. The major source of carnitine for the infant is in the mother's milk. Investigators at Vanderbilt University have shown that the infant fed a soy protein formula or maintained on intravenous feeding receives no carnitine, although many calories are supplied as fat. Since it has also been shown that carnitine is extremely low in a vegetarian diet one must consider the possibility that the breast milk of vegetarian mothers may have depressed carnitine content. When infants have inadequate tissue carnitine, they frequently suffer from severe hypoglycemia.

Cloning of Photosynthetic Genes in a Blue-Green Alga. A long-sought goal of plant researchers is to produce more efficient crop plants. New techniques for manipulating genes, "genetic engineering", have raised the possibility that genes for photosynthesis could be isolated, mutated, and inserted back into plant cells. A project at the University of Missouri is concerned with this possibility. The investigator has discovered that a blue-green alga contains small pieces of DNA called plasmids. Genes for certain reactions of photosynthesis can be inserted into the plasmid and as the algal cell grows, the plasmid carrying the desired gene will be reproduced. The technique now being developed, will be useful for cloning genes from crop plants and for development of a gene bank of desired characteristics.

Pheromones/Kairomones of Scale Insect Pests. Studies are underway to collect and identify the sex pheromone of a number of pest scale species such as the San Jose scale, walnut scale, citrus snow scale, and Florida red scale. Insects were cultured in the laboratory and a greenhouse bioassay (biological test) established. Airborne collections from female scales on host material were obtained and pheromones purified by chromatography. After bioassay of fractions the active compounds were identified by chemical and physical methods. The mating pheromone components of San Jose scale were identified. These components have been used in a number of field studies to monitor the population dynamics of this pest species. Mating pheromones have also been identified for California red scale and yellow scale. Work is currently underway at Cornell University for Florida red scale and obscure mealy bug. The synthetic attractants are used to develop potent and specific monitoring traps for the abundance of individual species. They are useful in pest management programs that depend upon sensitive monitoring information.

RURAL DEVELOPMENT RESEARCH

Under Title V of the Rural Development Act of 1972, funds have been allocated to the 50 States and Puerto Rico, and to the four regional rural development centers to "...provide research and investigation in all fields that have as their purpose the development of useful knowledge and information to assist those planning, carrying out, managing, or investing in facilities, services, businesses, or other enterprises, public and private, that may contribute to rural development."

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: Annual Plans of Work are developed jointly by Agricultural Experiment Stations and Extension to meet specific local or State needs, and are approved by a broadly based State Rural Development Advisory Council and by the Secretary of Agriculture. The program is administered by the Land-Grant Institutions of 1862 and involves 1890 Land-Grant Institutions and other public and private colleges and universities. Increasing the capacity of colleges and universities to perform the public service roles of research, transfer and application of knowledge in rural development is an important objective of Title V.

In the past year, approximately 65 research and 110 research/extension projects have been conducted under this program. A wide range of topics has been explored, such as the enhancement of the capacities of local agencies and community-based organizations, the improvement of low and moderate income housing, the protection of the environment, and the improvement of opportunities for families with small farms.

Selected examples of recent progress:

Determining Community Development Priorities. Scientists in Wisconsin have successfully established a model for determining development priorities in a community; for determining the type and level of consensus existing between citizens, elected officials and community leaders; and for improving communication and agreement on priorities. Survey methodologies have been tested and improved as one of the tools used in this project. A how-to-do-it handbook on "community needs assessment techniques" is anticipated for distribution to community agencies and leaders.

Efficient Delivery of Public Services. Researchers in Mississippi have developed computerized budgets for various levels of services and sizes of communities. Budgets have been completed for rural health clinics, transportation for elderly residents, fire protection, emergency medical services, and solid waste disposal. In the latter case, a computer program has been devised to efficiently design routing plans for gathering solid waste. These programs permit communities to make reliable financial plans when considering and designing these public services. The research results are being made available through Extension.

ANIMAL HEALTH AND DISEASE RESEARCH

The Animal Health and Disease Research (Section 1433, Public Law 95-113) program is directed to improving the health and productivity of animals and the welfare of producers and consumers of animal products; protecting human health through control of animal diseases transmissible to humans; minimizing livestock and poultry losses due to transportation and handling; and facilitating the effective treatment and prevention of animal diseases.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: \$5 million was appropriated for the first time in Fiscal Year 1979 for Sections 1433 and 1434 of Public Law 95-113. In consultation with the Animal Health Science Research Advisory Board authorized under this Law, it was determined that viable animal health research programs could be implemented most effectively under the requirements of Section 1433. Section 1434, therefore, was not utilized in disbursement of FY 1979 funds. In Fiscal Year 1980, \$6 million was appropriated specifically for Section 1433.

Institutions qualifying for FY 1980 funds under Section 1433 requirements included 26 Colleges of Veterinary Medicine, 51 State Agricultural Experiment Stations, 1 College of Medicine, and a Medical Research Center. Distribution of funds was made by formula requirements of Section 1433 based on the relative importance of livestock and poultry production in the States (48%) and the capacity of eligible institutions to conduct animal health research (48%). Four percent was retained by the Department for administration, program assistance to the eligible institutions, and program coordination.

Recommendations of the Animal Health Science Research Advisory Board have been followed in program implementation (i.e., scope and priorities of eligible research, determination of research capacity of eligible institutions and other questions on program administration). In accordance with advice of the Board, emphasis in this new research has centered on the solution of high priority diseases or other animal health hazards in the production of livestock, poultry, and aquaculture species.

State Comprehensive Plans for animal health research, approved by SEA-CR, were developed by the eligible institutions within each State. These plans include the major areas of animal health research to be conducted by the institutions and mechanisms to assure effective coordination of research among the institutions. Provisions of Section 1433 project implementation permit selection of studies within each State based on highest priority needs and capabilities of the institutions to conduct the needed research.

In Fiscal Year 1980 there were more than 330 projects conducted under Section 1433 funds. These are aimed at solution of infectious and noninfectious diseases or parasite problems of food animals and horses. Most projects are designed as three to five year studies. Strong emphasis is being placed on solution of respiratory, enteric, and reproductive diseases. Other major problems such as mastitis, pseudorabies, brucellosis, and pinkeye are being investigated. Causes of disease are under study; new methods for disease diagnosis and carrier detection are being sought; new or improved treatments are being tested; methods of increasing resistance to disease are being developed; and biological methods to replace chemical control of livestock insects and internal parasites are being evaluated.

Selected examples of recent progress:

Anaplasmosis - Control by Use of Antibiotics. Scientists at Oklahoma's Agricultural Experiment Station found that continuous feeding of chlorotetracycline medicated feed or a salt-mineral mix prevented the development of clinical disease to cattle on pasture even when the animals

were challenged with Anaplasma marginale infected blood. Experimentally induced outbreaks of acute anaplasmosis in cattle on pasture were successfully halted and controlled by a combination of one treatment with oxytetracycline and oral chlorotetracycline for 60 days provided free choice in a salt-mineral mix.

Anaplasmosis is a serious disease of cattle in southern states and has been spread by interstate movement of infected cattle. The antibiotic medication will provide a means to control the disease until more effective methods such as vaccination can be developed.

Shipping Fever in Cattle - Experimental Model and Vaccination Trials.

Scientists at Oklahoma Agricultural Experiment Station have developed a model to experimentally induce shipping fever in cattle. This model has been used to test techniques to prevent the disease. Lung resistance in response to vaccination has been determined to be greater if the vaccine is administered by aerosol rather than by other routes. Studies on the effectiveness of vaccines against Pasteurella hemolytica have indicated certain factors such as age of bacterial cultures in making the vaccine and its influence on virulence and perhaps antigenicity. This may lead to an injectable vaccine which is more practical for use on the farm. Shipping fever is a complex respiratory infection of cattle which costs the cattle industry up to \$3 billion annually. The studies at Oklahoma may provide a much needed model that will enhance the development of effective vaccines for this problem and reduce the loss from shipping fever.

Leptospirosis Cattle - Importance of Vaccination Program. Florida Agricultural Experiment Station scientists reported on nine cases of leptospirosis that occurred among milkers on two dairy farms and caused decline of calf crops from 91% to 68%. Serologic results identified Leptospira interrogans serovar hardjo as the infecting organisms in both milkers and cows on one farm. On the second farm L. interrogans serovar hardjo and pamona were implicated serologically in the cows and milkers. Cases of leptospirosis in the dairy cattle ceased after the use of vaccination program and no new cases of the disease occurred in the milkers. This report documents the public health hazard of spreading leptospiral infections of dairy cattle to milkers in close contact with infected animals and the importance of vaccination programs to protect animals against the disease and reducing the public health hazard.

SCIENCE AND EDUCATION ADMINISTRATION
EXTENSION

Purpose Statement

Cooperative agricultural extension work was established by the Smith- Lever Act of May 8, 1914, as amended. The legislation authorizes the Department of Agriculture to give, through the Land-Grant Colleges, instruction and practical demonstrations in agriculture and home economics and related subjects and to encourage the application of such information by demonstrations, publications, and other means to persons not attending or resident in the colleges. This work is further emphasized in Title XIV (National Agricultural Research, Extension, and Teaching Policy) of the Food and Agriculture Act of 1977.

The basic job of Cooperative Extension is to help people identify and solve their farm, home, and community problems through use of research findings of the Department of Agriculture and the State Land-Grant Colleges and programs administered by the Department of Agriculture. This work is carried out through State and County extension offices in each State, Puerto Rico, Guam, the Virgin Islands and the District of Columbia. The program is being extended to American Samoa and Micronesia beginning in 1981.

State and County extension work is financed from Federal, State, County, and local sources. These funds are used within the States for the employment of county agents, home economics agents, 4-H Club agents, State and area specialists, and others who conduct the joint educational programs adapted to local problems and conditions. There are approximately 17,000 State and County extension personnel employed throughout the States.

The Extension unit of the Science and Education Administration, USDA, as a partner in the cooperative effort, employs a national staff to coordinate the program by:

- Serving as liaison between the Department of Agriculture and the State extension services, providing program leadership and assistance to the States in the conduct of extension work.
- Administering Federal laws authorizing extension work and coordinating the work among the States.
- Providing leadership for the educational phases of all programs under the jurisdiction of the Department.

As of September 30, 1980 the employment ceiling for the Federal office was 180 full-time permanent employees and 12 other than permanent employees.

SCIENCE AND EDUCATION ADMINISTRATION

The new estimates include proposed changes in the language of this item as follows (new language underscored; deleted matter enclosed in brackets):

Extension Activities

Payments to States, Puerto Rico, Guam, and the Virgin Islands: For payments for cooperative agricultural extension work under the Smith-Lever Act, as amended by the Act of June 26, 1953, the Act of August 11, 1955, the Act of October 5, 1962 (7 U.S.C. 341-349), section 506 of the Act of June 23, 1972, and the Act of September 29, 1977 (7 U.S.C. 341-349), to be distributed under section 3(b) and 3(c) of the Act, for retirement and employees' compensation costs for extension agents, and for costs of penalty mail for cooperative extension agents and State extension directors, [\$205,448,000;] \$214,259,000; payments for the nutrition and family education program for low-income areas under section 3(d) of the Act [\$55,017,000;] \$59,424,000; [payments for urban gardening programs under section 3(d) of the Act, \$3,000,000;] payments for the pest management program under section 3(d) of the Act, [\$7,435,000;] \$8,031,000; [payments for the farm safety program under section 3(d) of the Act, \$1,020,000;] payments for the pesticide impact assessment program under section 3(d) of the Act, [\$1,805,000;] \$1,950,000; payments for the energy demonstration program under section 3(d) of the Act, [\$300,000;] \$324,000; payments for nonpoint source pollution program under section 3(d) of the Act \$1,404,000; payments for extension work under section 209(c) of Public Law 93-471, [\$910,000;] \$983,000; payments for extension work by the colleges receiving the benefits of the second Morrill Act (7 U.S.C. 321-326, 328) and Tuskegee Institute under Section 1444 of the National Agricultural Research, Extension and Teaching Policy Act of 1977 (Public Law 95-113), [\$11,250,000;] \$11,771,000; [for carrying out the provisions of section 22 of the Act of June 29, 1935, as amended (7 U.S.C. 329), \$11,500,000;] in all [\$297,685,000] \$298,146,000, [of which not less than \$78,600,000 is for Home Economics]: Provided, That funds hereby appropriated pursuant to section 3(c) of the Act of June 26, 1953, and section 506 of the Act of June 23, 1972, as amended, shall not be paid to any State, Puerto Rico, Guam, or the Virgin Islands prior to availability of an equal sum from non-Federal sources for expenditure during the current fiscal year.

Federal administration and coordination: For administration of the Smith-Lever Act, as amended by the Act of June 26, 1953, the Act of August 11, 1955, the Act of October 5, 1962, section 506 of the Act of June 23, 1972, section 209(d) of Public Law 93-471, and the Act of September 29, 1977 (7 U.S.C. 341-349), and to coordinate and provide program leadership for the extension and higher education work of the Department and the several States and insular possessions, [\$6,355,000,] \$6,964,000. [of which not less than \$2,100,000 is for Home Economics.] (Public Law 96-528 making appropriations for Agriculture, Rural Development, and Related Agencies, 1981).

The first change is for the purpose of deleting language which provides funds for the urban gardening program under section 3(d) of the Smith-Lever Act. No funding is proposed for this program in fiscal year 1982.

The second change is for the purpose of deleting language which provides funds for the farm safety program under section 3(d) of the Smith-Lever Act. No funding is proposed for this program in fiscal year 1982.

The third change provides language which authorizes funding for an earmarked program in the area of nonpoint source pollution under section 3(d) of the Smith-Lever Act.

The fourth change is for the purpose of deleting language which provides funds for the Bankhead-Jones Act.

The fifth and sixth changes are for the purpose of deleting the limitation established in the FY 1980 Appropriation Act on the amount of support for Extension's home economics program. This limitation conflicts with the primary intent of the Smith-Lever Act to give maximum latitude to the State Cooperative Extension Services to conduct programs according to the needs of their State.

SCIENCE AND EDUCATION ADMINISTRATION

EXTENSION ACTIVITIES

Appropriation Act, 1981.....	\$303,633,000
Budget Estimate, 1982.....	305,110,000
Increase in appropriation.....	<u>+1,477,000</u>

Adjustment in 1981:

Appropriation Act, 1981.....	\$303,633,000
1981 Supplemental Appropriation for Pay Cost.....	+407,000
Adjusted base for 1982.....	304,040,000
Budget estimate, 1982.....	305,110,000
Increase over adjusted 1981.....	<u>+1,070,000</u>

SUMMARY OF INCREASES AND DECREASES
(on basis of adjusted appropriation)

<u>Item of Change</u>	<u>1981 Estimated</u>	<u>Program Changes</u>	<u>1982 Estimated</u>
Smith-Lever:			
For Sections 3b & c.....	\$205,448,000	+\$8,811,000	\$214,259,000
Section 3d:			
Pest Management.....	7,435,000	+596,000	8,031,000
Farm Safety.....	1,020,000	-1,020,000	---
Energy.....	300,000	+24,000	324,000
Urban Gardening.....	3,000,000	-3,000,000	---
Nonpoint Source Pollution.....	--	+1,404,000	1,404,000
Food and Nutrition Education.....	55,017,000	+4,407,000	59,424,000
Pesticide Impact Assessment.....	1,805,000	+145,000	1,950,000
1890 Colleges and Tuskegee Institute..	11,250,000	+521,000	11,771,000
Bankhead-Jones.....	11,500,000	-11,500,000	---
D. C. Extension.....	910,000	+73,000	983,000
Federal Admin. & Coordination.....	6,355,000	+609,000	6,964,000
TOTAL AVAILABLE.....	<u>304,040,000</u>	<u>+1,070,000</u>	<u>305,110,000</u>

a/ Includes a total increase of \$15,086,000 toward increased operating costs in order to sustain performance levels for continuing programs. Also, includes \$100,000 for the portion of Federal pay increases absorbed in FY 1981 necessary to carry out the programs proposed in FY 1982.

PROJECT STATEMENT

Project	1980		1981 (estimated)		Increase or Decrease	1982 (estimated)	
	Amount	:Staff: Years:	Amount	:Staff: Years:		Amount	:Staff: Years:
I. Payments to States:							
a. Smith-Lever Act:							
(1) Sections 3b & c:							
Program.....	172,275,585:	116	185,462,000:	153:	+7,193,560	192,655,560:	156
Set-aside for							
Federal Admin-							
istration (4%)..	3,841,320:	--	4,486,000:	--:	+352,440	4,838,440:	
Total.....	176,116,905:	116	189,948,000:	153:	+7,546,000	197,494,000:	156
Penalty mail....	14,622,413:	--	15,500,000:	--:	+1,265,000	16,765,000:	
Subtotal, Sections							
3b & c.....	190,739,318:	116	205,448,000:	153:	+8,811,000	214,259,000:	156
(2) Section 3(d);							
Food and Nutri-							
tion (EFNEP)....	51,927,096:	6	55,017,000:	6:	+4,407,000	59,424,000:	6
Pest Management..	6,422,750:	4	7,435,000:	4:	+596,000	8,031,000:	4
Farm Safety.....	1,024,726:	3	1,020,000:	3:	-1,020,000	--	--
Pesticide Impact:							
Assessment....	1,838,029:	3	1,805,000:	3:	+145,000	1,950,000:	3
Urban Gardening..	3,000,000:	3	3,000,000:	3:	-3,000,000	--	--
Energy.....	299,800:	4	300,000:	4:	+24,000	324,000:	4
Nonpoint source							
pollution.....	--		--		+1,404,000	1,404,000:	3
Subtotal, Section							
3(d)	64,512,401:	23	68,577,000:	23:	+2,556,000	71,133,000:	20
Total, payments under							
the Smith-Lever Act...:	255,251,719:	139	274,025,000:	176:	+11,367,000(1):	285,392,000:	176
b. Payments to the							
District of							
Columbia:							
Program.....	825,600:	3	873,600:	3:	+70,080	943,680:	3
Set-aside for							
Federal Admin-							
istration (4%)..	36,400:	--	36,400:		+2,920	39,320:	--
Total, payments to							
the District of							
Columbia.....	862,000:	3	910,000:	3:	+73,000(2):	983,000:	3
d. Payments under							
Title V, Rural							
Development Act							
of 1972:							
Program.....	2,400,000:	3	--	--:	--	--	--
Set-aside for							
Federal Admin-							
istration (4%)..	100,000:	--	--	--:	--	--	--
Total, Title V,							
Rural Development...:	2,500,000:	3	--	--:	--	--	--

Project	1980		1981 (estimated)			1982 (estimated)	
	Amount	Staff Years	Amount	Staff Years	Increase or Decrease	Amount	Staff Years
e. Payments to 1890 Colleges and Tuskegee Insti- tute:							
Program.....	9,686,546	3	10,800,000	3	+500,160	11,300,160	3
Set aside for Federal Adminin- stration (4%)	418,120	--	450,000	--	+20,840	470,840	--
Total, payments to 1890 Colleges and Tuskegee Institute.	10,104,666	3	11,250,000	3	+521,000(3)	11,771,000	3
2. Bankhead-Jones Act (Aid to Land-Grant Colleges).....	11,500,000	--	11,500,000	--	-11,500,000(4)	--	--
3. Federal Administra- tion and Coordination: (Direct Appropriation)	4,776,861	12	6,355,000	12	+609,000(5)	6,964,000	12
Unobligated balance..	263,877	--	--	--	--	--	--
Total available or estimate.....	285,259,123	160	304,040,000	194	+1,070,000	305,110,000	194
Proposed Supplemental for pay increase costs:	--	--	-407,000				
Total, appropriation...	285,259,123	160	303,633,000	194			

Explanation of Program

Appropriations for the Extension unit of the Science and Education Administration enable the U.S. Department of Agriculture to perform its partnership role with its State and County counterparts to carry out cooperative agricultural extension work for the benefit of our Nation's farmers and ranchers, agricultural industries, rural and urban communities, families and youth, and the ultimate consumers.

Cooperative agricultural extension work is authorized under the Smith-Lever Act of 1914, as amended; the Rural Development Act of 1972, as amended; and the District of Columbia Public Postsecondary Education Reorganization Act. The National Agricultural Research, Extension and Teaching Policy Act of 1977 also authorizes the Federal Government, States and Counties to implement cooperative agricultural extension programs commensurate with needs stemming from changes in U.S. agricultural practices and the world food and agricultural situation.

Through these basic legislative authorities, a variety of programs broadly identified under the following major thrusts are conducted by the Cooperative Extension Services in each State, Puerto Rico, Guam, the Virgin Islands, the District of Columbia, American Samoa, and Micronesia.

--Agriculture -- This program serves as the primary delivery system of all agricultural research in all counties and communities throughout the States. Approximately 6,702 staff-years or 39.4% of the total Extension professional staff-time is in support of this program which emphasizes the attainment of highly efficient systems of production, processing and marketing of food and fiber by commercial farmers, small and limited resource farmers, and others engaged in agriculture.

--Natural Resources -- This program accounts for about 493 staff years or 2.9% of Extension professional staff-time. Among the current areas of emphasis are forests and rangelands management, fish and wildlife, outdoor recreation, environmental conservation and management, and public policy.

--Community Resource Development -- This program helps local officials and community leaders to more clearly identify their specific needs and resources, better understand possible solutions, formulate action plans, and carry out their decisions. Approximately 1,429 staff-years or 8.4% of the total Extension professional staff-time is in support of this program which includes assistance in manpower development, community services and facilities, and other community development programs.

--Home Economics -- This program is directed to families and individuals at all levels of society to help them identify their needs, make improved decisions, and use and conserve their resources to achieve a desirable level of living. Approximately 3,963 staff-years or 23.3% of Extension professional staff-time is in support of this program which includes assistance in food and nutrition, clothing and textiles, family resource management, human development and parenting, and health and safety.

--4-H Youth -- This program is designed to help youth from all racial, ethnic, and socio-economic backgrounds develop life skills through participation in 4-H Clubs, 4-H special interest groups, instructional 4-H T.V. series, and special 4-H nutritional education programs. Approximately 4,422 staff-years or 26.0% of the total Extension professional staff-time is in support of this program.

JUSTIFICATION OF INCREASES AND DECREASES

- (1) A net increase of \$11,367,000 for payments to states for cooperative agricultural extension work under the Smith-Lever Act consisting of:

- (a) An increase of \$8,811,000 in funds authorized under sections 3(b) and 3(c) of the Smith-Lever Act for increased operating costs (\$205,448,000 available in 1981).

Need for Change. Increasing costs of operations due to inflation and continuing pressures from Extension's clientele, as well as the Congress, for expanded assistance to solve emerging farm, rural and urban problems dictate the need for these additional funds.

The costs of these programs continues to mount and contributions by the Federal, State, and local governments although also increasing through the years, are still insufficient to meet constantly rising salaries, services, supplies, equipment, etc.

Nature of Change. The requested increase will assist the states in maintaining their programs at current levels. Funds will be allocated to the States in accordance with the Smith-Lever Act, sections 3(b) & (c) formula provisions to ameliorate the affects of inflation on salary and non-salary operating costs.

- (b) A net increase of \$2,556,000 in funds authorized under section 3(d) of the Smith-Lever Act consisting of:

1. An increase of \$4,407,000 for the Expanded Food and Nutrition Education Program (EFNEP) for increased operating costs (\$55,017,000 available in 1981).

Need for Change. The costs of operating the program have continued to rise because of increases in salaries, benefits, and other operating costs.

Nature of Change. This increase will enable the States to operate programs at basically the same level as in FY 1981. These funds would be provided to the States on the basis of present distribution of EFNEP funds (as appropriated under section 3(d) of the Smith-Lever Act).

2. An increase of \$596,000 for the Integrated Pest Management Program (IPM) for increased operating costs (\$7,435,000 available in 1981).

Need for Change. These additional funds are requested to maintain this program at current levels. The State Cooperative Extension Services have used these funds to establish IPM programs in a limited number of counties in all States, Puerto Rico, and the Virgin Islands. The program involves the management of complexes of insects, diseases, weeds, nematodes, and other pests as appropriate to local agriculture and on 43 major commodities. With increased demonstrations and technical assistance, producers and homeowners will be able to reduce the use of pesticides, stabilize their agricultural production, increase their net profits, improve their environment, and reduce the environmental hazards to soil, water, and man from pesticides. Continuation of ongoing Extension IPM programs at present levels will also assure that all appropriate research is incorporated into Extension programs for farmers, ranchers, and homeowners.

Nature of Change. Increased funding will enable the states to operate programs at basically the same level as in FY 1981.

3. A decrease of \$4,020,000 to eliminate earmarked funding for farm safety (\$1,020,000 and urban gardening (\$3,000,000).

Need for Change. This proposal eliminates specifically earmarked funding for these programs under section 3(d) of the Smith-Lever Act. The main purpose of providing earmarked funding is to focus attention on a specific problem that has national implications. The Department feels that this objective has been accomplished in these two programs. For example, we believe that the essentiality of the farm safety program has been demonstrated to the point where about one half of the states will continue to provide this type of assistance as part of their regular programs, in comparison to only 8 states that were conducting this program prior to its initiation in 1975.

The urban gardening program currently being carried out in 16 major U.S. cities as pilot programs was initiated in 1977 to demonstrate the benefits of home gardening in our urban areas. This program was invaluable in teaching participants in our major cities the benefits of home gardening. For this reason, a large number of states have incorporated similar gardening information and assistance within their normal responsibilities through the Master Gardener programs.

Nature of Change. These proposals would eliminate specifically earmarked funds for these programs under section 3(d) of the Smith-Lever Act.

4. An increase of \$145,000 for the National Agricultural Pesticides Impact Assessment Program (NAPIAP) for increased operating costs (\$1,805,000 available in 1981).

Need for Change. Increasing operating costs have made it difficult for Extension to maintain State Extension Specialists who have the background and understanding of the local, State, and regional pesticide problems and practices essential to the success of this program. Additional funds would enable the States to maintain current staffing and program levels.

Nature of Change. Increased funding will enable the states to operate programs at basically the same level as in FY 1981.

5. An increase of \$24,000 for the Energy Extension Program for increased operating costs (\$300,000 available in 1981).

Need for Change. Increased funding is requested to maintain Extension's input to the operation of SEA's solar energy regional centers at Tifton and Peoria at current levels.

Nature of Change. Increased funding will provide for increased operating costs of the Extension programs at the Centers.

6. An increase of \$1,404,000 for Nonpoint Source Pollution Programs.
- Need for Change. Agriculture is alleged to be the most widespread cause of nonpoint source pollution. The most severe problems of water quality were given these priorities in the assessments conducted under the Soil and Water Resource Conservation Act (RCA): toxics, organic wastes, high level of nutrients, dissolved solids, and suspended sediment. Individual states are currently defining the magnitude, extent, location, and nature of water quality problems, under EPA's "208" of P.L. 92-500 planning process. Effective educational programs to correct water problems cannot get underway until these problems have been identified and legitimized in the affected states. Once legitimized, target audiences for educational programs can be identified, and educational programs prepared to get at the source of the problems.

The needed educational programs will be designed to make the general public and specific target audiences aware of the problem; to suggest potential solutions that are both economically and socially feasible; to present alternative solutions wherever possible; to allow landowners a maximum of freedom of choice; to forecast the likely impacts of the various alternatives on the water quality problem; and to assist landowners in assessing personal economic and social impacts.

In spite of a substantial areawide waste treatment management planning effort by EPA and State water quality agencies, the Agricultural Advisor to the EPA administrator stated on June 7, 1980 that "75 percent of the Nation's farmers still do not understand "208" and further stated that there is a big education job that needs to be carried out by Extension. There are many situations where rural people are confused and feel threatened by the number and complexity of new government regulations coming from a variety of agencies. Most rural people are familiar with their local County Extension Agents. This increase would initiate an Extension non-point source pollution effort in all states so Extension Agents can explain the rather complex Federal regulatory requirements to farmers and private landowners.

The general public needs to be aware of the importance of water resource in order to support conservation, and the land manager must know how to select economical and physically acceptable solutions. These solutions must be compatible with the existing management systems, or acceptable alternative systems. Extension has the expertise to integrate these educational programs into existing Extension programs. County agents have the rapport to reach farm and other audiences with educational programs which interpret water quality regulations for them.

Nonpoint source pollution can be controlled by voluntary changes in management practices by individuals, many of whom do not even realize that their present practices result in pollution. Present EPA and USDA policy calls for voluntary, non-regulatory programs for improved management of agricultural nonpoint sources. Education is the key.

Nature of Change. These funds will be used to expand assistance in the area and state nonpoint planning and in providing assistance to private landowners. Farmers will be encouraged to adopt "best management practices" for controlling or preventing nonpoint source pollutants from croplands, rangelands, and forests and the subsequent degradation of streams, lakes, and underground water resources. These programs will help meet the objectives of Section 208 of P.L. 92-500 the Clean Water Act of 1977, as well as the Safe Drinking Water Act, the Clean Air Act, the Resources Conservation Act, and the Toxic Substances Control Act.

- (2) An increase of \$73,000 in funds authorized under Public Law 90-354 for DC Extension for increased operating costs (\$910,000 available in 1981).

Need for Change. The D.C. Cooperative Extension Service assists the citizens of the District to solve pressing problems, especially in the areas of youth development, family living, home horticulture, consumer education, community resource development, and food and nutrition. To keep this program at current levels, increased funding is needed by the institution to offset increased operating costs such as salaries, supplies, equipment and other costs.

Nature of Change. Increased funding will enable the institution to operate at basically the same level as in FY 1981.

- (3) An increase of \$521,000 in funds authorized under Section 1444 of the Food and Agriculture Act of 1977 for the 1890 colleges and Tuskegee Institute for increased operating costs (\$11,250,000 available in 1981)

Need for Change. Sec. 1444 of the Food and Agriculture Act of 1977, required the 1890 colleges and Tuskegee Institute to assume substantial additional administrative responsibilities previously carried out for them by the 1862 institutions. These institutions have not been fully compensated for the costs of these additional responsibilities resulting in an undue burden being placed on them. The result was an effective decrease in funds available to carry out Extension programs. Funds available for program activities are being further depleted by rising costs for salaries, services, supplies, equipment and other operating costs.

Nature of Change. These funds will enable the institutions to shoulder anticipated increases in operating costs. Funds will be distributed to the 1890 colleges and Tuskegee Institute in accordance with the formula prescribed in Section 1444 of P.L. 95-113.

- (4) A decrease of \$11,500,000 to eliminate funding under the Bankhead-Jones Act.

Need for Change. Section 22 of the Bankhead-Jones Act provides funds to the land-grant colleges "for support of agriculture, the mechanic arts and related fields." The largest share of these funds has been used to support educational programs in related fields as opposed to direct support of agricultural education.

On the average, Bankhead-Jones funds accounted for only a small percentage of all instructional expenditures for Land-Grant Institutions. These funds are being proposed for termination because of the relative insignificance of these funds when compared to the total resource needs of the land-grant institutions for teaching programs and because of lack of focus on food and agricultural sciences.

Nature of Change. The Program will be terminated.

- (5) An increase of \$609,000 for Federal Administration and Coordination (direct appropriation) for fiscal year 1982 (\$6,355,000 available in 1981).

- (a) An increase of \$509,000 for increased operating costs.

Need for Change: Increased non-salary operating costs of administering the Cooperative Extension programs results from the annual rate of inflation.

Nature of Change. This increase is needed to maintain equivalent purchasing power for program support based on the rate of inflation over the FY 1981 base.

- (b) An increase of \$100,000 for Fiscal Year 1981 pay increases.

STATUS OF PROGRAM

SEA-Extension is the educational arm of the U.S. Department of Agriculture (USDA) and the Federal member of a nationwide educational delivery system that reaches into virtually every county in the United States and its territories. The education is off-campus and informal. It is conducted by the State Cooperative Extension Services, a part of the Nation's land-grant universities.

The "educators" include some 17,000 Cooperative Extension professionals and approximately 10,000 aids or paraprofessionals, as well as hundreds of thousands of volunteers. The "students" are farmers, businessmen, families, youth, consumers, and community leaders. Backing up the system is the research competency of the land-grant universities, SEA-Agricultural Research, and program agencies of USDA, such as Food and Nutrition Service, Farmers Home Administration, and Soil Conservation Service.

It is a grassroots system with local people, land-grant universities, and USDA sharing the responsibility of determining educational needs and program design. Currently, programs are organized under the categories of agriculture, natural resources, home economics (including family education and food and nutrition), community and rural development, and 4-H youth development. National concerns now addressed under these categories include integrated pest management, pollution, energy conservation, coping with inflation, nutrition education, soil and water conservation and management, management of private forest lands, and the needs of small farmers.

As a full partner in the State-Federal system, SEA-Extension provides program leadership, program planning, and funds. Federal funds account for about 40 percent of the total dollars spent on Extension education. State and county funds account for the remainder. The private sector also provides significant support to the 4-H youth programs of the Extension system.

Some 60 percent of the Federal funds for Extension are administered by SEA-Extension under the formula provisions of the Smith-Lever Act. Other special appropriations include nutrition education for low-income people, Extension programs conducted by 1890 land-grant colleges and Tuskegee Institute, farm safety, integrated pest management, pesticide impact assessment, and urban gardening.

Funds appropriated under the Smith-Lever Act represent a major portion of the total Federal payments to 1862 State Extension Services in support of the national Extension program. These funds are distributed to each State, Puerto Rico, Guam, and the Virgin Islands primarily on the basis of farm and rural populations and also on the basis of special problems and needs.

Sixteen border and southern States are using funds appropriated under Section 1444 of P.L. 95-113 for 1890 colleges and Tuskegee Institute to support Extension projects designed to develop and improve informed decisionmaking skills. These Extension Services are continuing to develop improved instructional materials and program delivery methodologies to better service previously unreachd clientele. State Extension systems are applying this support to increase services to all clientele, especially those with limited resources.

Funds from the Smith-Lever Act and Section 1444 are used primarily for the employment of State, area, and county Extension personnel, who work with individuals, families, community organizations, business firms, and others. Extension personnel provide advice and assist in the application of improved methods for agriculture production and marketing, forestry and natural resources, human nutrition, family living, community and rural development, and 4-H youth development.

Following are descriptions of current activities with selected examples of accomplishments from these appropriated funds.

Payments to States

Federal funds available for fiscal year 1981 under the appropriation "Payments to States" for cooperative agricultural extension work under the Smith-Lever Act, the D. C. Public Postsecondary Education Reorganization Act, and section 1444 of the National Agricultural Research, Extension and Teaching Policy Act of 1977 total \$286,185,000. In addition, \$11,500,000 was appropriated under section 22 of the Bankhead-Jones Act for support of instruction in agriculture, the mechanic arts, and related fields at the Land-Grant colleges.

Amounts appropriated are made available to States, Puerto Rico, Guam and the Virgin Islands by letter of credit. Funds are disbursed in accordance with budgets and plans of work submitted by the States and approved by SEA-Extension on behalf of the Secretary of Agriculture. As reflected in Table III, about 40 percent of the cost of Extension work at present is being financed from Federal sources and about 60 percent from State and local sources.

The funds are used by the States for the employment of Extension workers to carry on cooperative agricultural extension work. Paid Extension workers are assisted by volunteer leaders who cooperate in carrying out Extension programs.

The use of these funds is indicated in greater detail in the following tables:

Table I reflects estimated allotments to States, Puerto Rico, Guam, and the Virgin Islands under the formula provisions of Section 3(b) and 3(c) of the Smith-Lever Act.

Supplementary Tables IA, 1B, 1C and 1D reflect the estimated allotments for pesticide impact assessment and food and human nutrition education (EFNEP) under Section 3(d) (Non-formula) of the Act, payments to the 1890 Land-Grant Colleges and Tuskegee Institute and payments under Section 22 of the Bankhead-Jones Act.

Table II shows the basis on which the allotments will be made and the extent to which they must be matched by the State and local sources.

Table III indicates the sources of funds allotted for Cooperative Extension work in the States, Puerto Rico, Guam, and the Virgin Islands for fiscal year 1981.

Table IV indicates the various classes of field agents employed with Extension funds.

Table I
APPROPRIATIONS FOR PAYMENTS TO STATES, STATE ALLOTMENTS, FY 1981-1982

Smith-Lever Act: Sections 3(b) and 3(c)	FY-1981	Inc. or Dec. FY 1982	Total Proposed for FY 1982
Alabama	4,577,610	181,275	4,758,885
Alaska	610,850	40,689	651,539
American Samoa	526,842	32,595	559,437
Arizona	1,091,672	62,095	1,153,767
Arkansas	3,797,771	157,994	3,955,765
California	4,397,695	214,780	4,612,475
Colorado	1,721,644	93,597	1,815,241
Connecticut	1,300,729	78,721	1,379,450
Delaware	722,137	44,573	766,710
Florida	2,510,148	140,141	2,650,289
Georgia	5,008,337	209,813	5,218,150
Guam	550,815	34,817	585,632
Hawaii	807,867	41,051	848,918
Idaho	1,519,255	87,631	1,606,886
Illinois	5,756,438	314,709	6,071,147
Indiana	5,119,778	289,603	5,409,381
Iowa	5,421,963	306,131	5,728,094
Kansas	3,234,296	170,944	3,405,240
Kentucky	5,588,406	274,807	5,863,213
Louisiana	3,356,176	151,166	3,507,342
Maine	1,302,595	69,639	1,372,234
Maryland	2,000,347	111,506	2,111,853
Massachusetts	1,632,395	92,019	1,724,414
Michigan	5,247,457	282,093	5,529,550
Micronesia	541,940	34,101	576,041
Minnesota	5,119,289	287,667	5,406,956
Mississippi	4,813,929	188,810	5,002,739
Missouri	5,115,666	257,688	5,373,354
Montana	1,438,859	82,873	1,521,732
Nebraska	2,894,939	159,251	3,054,190
Nevada	612,953	39,515	652,468
New Hampshire	894,168	54,038	948,206
New Jersey	1,605,112	92,216	1,697,328
New Mexico	1,193,698	64,319	1,258,017
New York	5,017,717	267,078	5,284,795
North Carolina	7,553,044	349,422	7,902,466
North Dakota	2,025,275	111,692	2,136,967
Ohio	6,338,722	337,495	6,676,217
Oklahoma	3,339,427	149,865	3,489,292
Oregon	2,016,175	113,122	2,129,297
Pennsylvania	6,248,601	325,425	6,574,026
Puerto Rico	5,009,335	224,212	5,233,547
Rhode Island	616,891	39,189	656,080
South Carolina	3,738,914	157,839	3,896,753
South Dakota	2,078,531	117,311	2,195,842
Tennessee	5,479,886	254,444	5,734,330
Texas	7,552,135	321,993	7,874,128
Utah	965,862	53,828	1,019,690
Vermont	1,019,396	59,619	1,079,015
Virginia	4,546,691	211,547	4,758,238
Virgin Islands	532,657	33,791	566,448
Washington	2,410,052	131,868	2,541,920
West Virginia	2,646,234	118,593	2,764,827
Wisconsin	5,112,009	286,270	5,398,279
Wyoming	857,761	51,090	908,851
Subtotal	167,139,091	8,458,560	175,597,651
Special Needs, Sec 3(b), Smith-Lever Act	1,544,909	--	1,544,909
TOTAL	168,684,000	8,458,560	177,142,560

Table IA

APPROPRIATIONS FOR PAYMENTS TO STATES
PESTICIDE IMPACT ASSESSMENT, FY 1981 - 1982

Smith-Lever Act: Section 3(d)	Fiscal Year 1981	Increase or Decrease Fiscal Year 1982	Total Proposed Fiscal Year 1982
Alabama	26,948	2,397	29,345
Alaska	8,571	72	8,643
Arizona	19,612	1,469	21,081
Arkansas	42,807	4,404	47,211
California	95,100	11,020	106,120
Colorado	20,769	1,615	22,384
Connecticut	11,670	468	12,138
Delaware	11,421	433	11,854
Florida	38,343	3,839	42,182
Georgia	60,583	6,654	67,237
Guam	8,720	91	8,811
Hawaii	11,696	468	12,164
Idaho	20,530	1,585	22,115
Illinois	86,006	9,870	95,876
Indiana	44,067	4,560	48,627
Iowa	82,531	9,429	91,960
Kansas	36,545	3,613	40,158
Kentucky	23,163	1,919	25,082
Louisiana	25,599	2,227	27,826
Maine	14,486	821	15,307
Maryland	17,895	1,252	19,147
Massachusetts	15,366	933	16,299
Michigan	35,825	3,520	39,345
Minnesota	55,302	5,985	61,287
Mississippi	43,101	4,441	47,542
Missouri	39,501	3,986	43,487
Montana	17,795	1,239	19,034
Nebraska	54,995	5,946	60,941
Nevada	10,028	256	10,284
New Hampshire	9,807	229	10,036
New Jersey	15,907	1,001	16,908
New Mexico	12,475	566	13,041
New York	32,436	3,093	35,529
North Carolina	49,188	5,212	54,400
North Dakota	22,462	1,830	24,292
Ohio	44,882	4,667	49,549
Oklahoma	29,477	2,717	32,194
Oregon	22,269	1,806	24,075
Pennsylvania	26,927	2,394	29,321
Puerto Rico	8,604	76	8,680
Rhode Island	10,792	353	11,145
South Carolina	28,244	2,561	30,805
South Dakota	21,299	1,683	22,982
Tennessee	25,215	2,178	27,393
Texas	84,198	9,639	93,837
Utah	12,094	518	12,612
Vermont	10,550	323	10,873
Virginia	25,450	2,267	27,717
Virgin Islands	9,072	76	9,148
Washington	29,077	2,667	31,744
West Virginia	11,965	502	12,467
Wisconsin	37,407	3,721	41,128
Wyoming	11,228	409	11,637
Special Projects	235,000	- -	235,000
TOTAL	1,805,000	145,000	1,950,000

Table 1B

APPROPRIATIONS FOR PAYMENTS TO STATES
FOOD AND HUMAN NUTRITION EDUCATION FY 1981-1982

Smith-Lever Act Section 3(d)	FY 1981	Inc. or Dec. FY 1982	Total Proposed For FY 1982
Alabama	1,791,271	126,877	1,918,148
Alaska	155,152	13,520	168,672
Arizona	498,570	45,131	543,701
Arkansas	1,140,876	80,788	1,221,664
California	2,887,173	305,598	3,192,771
Colorado	493,708	44,933	538,641
Connecticut	401,962	37,912	439,874
Delaware	198,594	16,653	215,247
Florida	1,811,610	158,766	1,970,376
Georgia	1,948,589	136,158	2,084,747
Hawaii	231,691	18,081	249,772
Idaho	261,482	21,294	282,776
Illinois	1,900,868	162,058	2,062,926
Indiana	1,083,159	76,703	1,159,862
Iowa	818,458	52,588	871,046
Kansas	622,674	46,638	669,312
Kentucky	1,503,313	107,719	1,611,032
Louisiana	1,681,049	137,308	1,818,357
Maine	379,599	26,767	406,366
Maryland	752,808	61,988	814,796
Massachusetts	862,563	73,926	936,489
Michigan	1,600,659	121,681	1,722,340
Minnesota	895,115	63,495	958,610
Mississippi	1,549,554	114,383	1,663,937
Missouri	1,398,225	101,373	1,499,598
Montana	266,033	21,294	287,327
Nebraska	485,619	34,620	520,239
Nevada	151,534	14,630	166,164
New Hampshire	212,868	17,565	230,433
New Jersey	946,259	87,769	1,034,028
New Mexico	453,573	39,975	493,548
New York	3,005,641	282,593	3,288,234
North Carolina	2,293,098	146,073	2,439,171
North Dakota	311,538	21,492	333,030
Ohio	1,965,898	152,300	2,118,198
Oklahoma	943,537	72,776	1,016,313
Oregon	436,305	41,046	477,351
Pennsylvania	2,418,408	178,002	2,596,410
Puerto Rico	1,169,070	250,030	1,419,100
Rhode Island	271,518	22,444	293,962
South Carolina	1,385,274	90,704	1,475,978
South Dakota	351,072	25,141	376,213
Tennessee	1,789,094	124,021	1,913,115
Texas	3,767,542	290,962	4,058,504
Utah	273,385	24,982	298,367
Vermont	211,644	15,780	227,424
Virginia	1,527,504	103,912	1,631,416
Washington	601,908	54,929	656,837
West Virginia	884,149	61,076	945,225
Wisconsin	856,672	66,669	923,341
Wyoming	169,135	13,877	183,012
Special Studies	1,000,000	- -	1,000,000
TOTAL	55,017,000	4,407,000	59,424,000

Table 1C

APPROPRIATIONS FOR PAYMENTS TO THE 1890 LAND-GRANT COLLEGES
AND TUSKEGEE INSTITUTE, FY 1981 - 1982

Food & Agriculture Act: Sec. 1444	FY 1981	Inc. or Dec. FY 1982	Proposed for FY 1982
ALABAMA:			
Alabama A&M University	607,530	+27,117	634,647
Tuskegee Institute	607,530	+27,117	634,647
ARKANSAS:	525,883	+24,021	549,904
Univ. of Arkansas at Pine Bluff			
DELAWARE:	206,325	+7,816	214,141
Delaware State College			
FLORIDA:	464,289	+21,100	485,389
Florida A&M University			
GEORGIA:	682,272	+31,052	713,324
Fort Valley State College			
KENTUCKY:	822,145	+40,910	863,055
Kentucky State University			
LOUISIANA:	506,500	+22,801	529,301
Southern Univ. and A&M College			
MARYLAND	390,406	+17,161	407,567
Univ. of Maryland Eastern Shore			
MISSISSIPPI:	639,703	+28,388	668,091
Alcorn State University			
MISSOURI:	781,219	+38,474	819,693
Lincoln University			
NORTH CAROLINA:	1,078,124	+51,015	1,129,139
North Carolina A&T State Univ.			
OKLAHOMA:	489,156	+22,925	512,081
Langston University			
SOUTH CAROLINA:	548,350	+23,698	572,048
South Carolina Stte College			
TENNESSEE:	794,285	+37,827	832,112
Tennessee State University			
TEXAS:	977,675	+47,345	1,025,020
Prairie View A&M University			
VIRGINIA:	678,608	+31,393	710,001
Virginia State College			
Federal Administration	450,000	+20,840	470,840
TOTAL	11,250,000	+521,000	11,771,000

Table 1D

APPROPRIATIONS FOR PAYMENTS TO STATES
UNDER SECTION 22, BANKHEAD-JONES ACT FY 1981 - 1982

	FY 1981	Inc. or Dec. FY 1982	Total Proposed FY 1982
Alabama	201,442	-201,442	-0-
Alaska	149,626	-149,626	-0-
Arizona	173,873	-173,873	-0-
Arkansas	176,361	-176,361	-0-
California	473,696	-473,696	-0-
Colorado	181,043	-181,043	-0-
Connecticut	194,648	-194,648	-0-
Delaware	153,682	-153,682	-0-
District of Columbia	157,118	-157,118	-0-
Florida	256,610	-256,610	-0-
Georgia	220,331	-220,331	-0-
Guam	146,045	-146,045	-0-
Hawaii	157,340	-157,340	-0-
Idaho	156,401	-156,401	-0-
Illinois	327,927	-327,927	-0-
Indiana	230,293	-230,293	-0-
Iowa	191,232	-191,232	-0-
Kansas	181,733	-181,733	-0-
Kentucky	197,734	-197,734	-0-
Louisiana	204,724	-204,724	-0-
Maine	161,030	-161,030	-0-
Maryland	209,328	-209,328	-0-
Massachusetts	238,465	-238,465	-0-
Michigan	291,005	-291,005	-0-
Minnesota	207,394	-207,394	-0-
Mississippi	181,203	-181,203	-0-
Missouri	221,779	-221,779	-0-
Montana	156,095	-156,095	-0-
Nebraska	169,113	-169,113	-0-
Nevada	152,703	-152,703	-0-
New Hampshire	156,808	-156,808	-0-
New Jersey	262,855	-262,855	-0-
New Mexico	161,398	-161,398	-0-
New York	445,465	-445,465	-0-
North Carolina	228,453	-228,453	-0-
North Dakota	154,831	-154,831	-0-
Ohio	320,309	-320,309	-0-
Oklahoma	186,848	-186,848	-0-
Oregon	179,133	-179,133	-0-
Pennsylvania	339,140	-339,140	-0-
Puerto Rico	189,368	-189,368	-0-
Rhode Island	160,305	-160,305	-0-
South Carolina	187,364	-187,364	-0-
South Dakota	155,630	-155,630	-0-
Tennessee	209,358	-209,358	-0-
Texas	329,292	-329,292	-0-
Utah	162,112	-162,112	-0-
Vermont	151,977	-151,977	-0-
Virginia	145,673	-145,673	-0-
Virgin Islands	221,302	-221,302	-0-
Washington	200,864	-200,864	-0-
West Virginia	173,407	-173,407	-0-
Wisconsin	217,499	-217,499	-0-
Wyoming	150,124	-150,124	-0-
American Samoa	145,090	-145,090	-0-
Micronesia	145,421	-145,421	-0-
TOTAL	11,500,000	-11,500,000	-0-

Table II

APPROPRIATION FOR PAYMENTS TO STATES

Basis of Allotment and Matching Required, Fiscal Year 1982

Item	Total Estimate 1982	Allotment	Amount Paid Without Matching	Amount Required Matching
Smith-Lever Act: Section 3(b)	\$285,392,000	\$56,475,091- Fixed by Section 3(b): of PL 87-749: 1,544,909-Special need	\$ 14,513,808: - -	\$ 41,961,283 1,544,909
Section 3(c)	123,961,000 47,569,024-by farm pop- ulation 47,569,024-by rural population 23,984,512-equally; and 4,838,440-for federal administra- tion and co- ordination Sec. 3(c) 1		4,838,440:	119,122,560
Retirement & Employee Compen- sation Cost	16,033,000-Federal con- tribution to these funds		16,033,000:	- -
Penalty Mail	16,245,000-Reimbursement to the Post- al Service		16,245,000:	- -
Section 3(d)	71,133,000-Allocated on basis of ap- proved pro- jects.		71,133,000:	- -
Title XIV, Food & Agr'l Act, 1977 Section 1444, 1890 Land-Grant Colleges	11,771,000	11,771,000-4% Federal Adm., balance: paid to 1890 colleges and Tuskegee	11,771,000:	- -
D. C. Public Postsecondary Education Reorganization Act.	983,000	983,000 943,680-to District of Columbia 39,320-for Federal administra- tion & Coord.	39,320:	943,680
Total	298,146,000	298,146,000	134,573,568:	163,572,432

Table III
SOURCES OF FUNDS ALLOTTED FOR COOPERATIVE EXTENSION WORK
For Fiscal Year Ending September 30, 1981

States	Grand Total	Total Federal Funds	Total Within States	Funds from Federal Sources		Funds from Non-Federal Sources	
				Act.	Sec. 1444	PL 95-113	State
Alabama	19,406,049	7,980,049	11,526,859	6,664,889	1,215,060	9,539,010	1,794,546
Alaska	3,293,744	877,573	2,416,171	877,573	-	2,366,171	193,203
Arizona	5,620,560	1,826,554	3,794,006	1,826,554	-	3,501,524	50,000
Arkansas	15,322,690	5,787,727	9,534,963	5,261,844	525,883	8,418,552	107,858
California	39,346,473	7,889,968	31,456,505	7,889,968	-	24,356,118	1,631,617
Colorado	11,919,413	2,409,121	9,504,298	2,409,121	-	5,405,009	673,705
Connecticut	3,710,859	1,786,361	1,924,498	1,786,361	-	1,847,548	76,950
Delaware	2,129,544	1,210,477	919,067	1,004,152	206,325	771,831	129,736
Florida	23,231,029	5,140,390	18,090,639	4,676,101	464,289	9,450,374	240,234
Georgia	29,201,297	8,196,736	21,004,561	7,514,464	682,272	15,152,455	2,069,477
Guam	965,821	570,535	395,286	570,535	-	395,286	-
Hawaii	3,557,291	1,123,254	2,434,037	1,123,254	-	2,434,037	-
Idaho	5,713,227	1,980,547	3,732,680	1,980,547	-	2,294,400	-
Illinois	22,407,598	8,303,312	14,104,286	8,303,312	-	10,817,650	1,777,955
Indiana	18,551,525	6,446,004	12,105,521	6,446,004	-	5,554,390	1,106,544
Iowa	19,849,240	6,582,952	13,265,288	6,582,952	-	8,177,644	940,542
Kansas	19,841,978	4,099,015	15,742,963	4,099,015	-	6,165,405	7,421,353
Kentucky	20,050,817	8,040,027	12,010,790	7,217,382	822,145	8,207,870	2,156,205
Louisiana	19,249,221	6,013,664	13,235,557	5,507,164	506,500	12,664,706	556,428
Maine	4,017,116	1,799,680	2,217,436	1,799,680	-	1,686,758	44,158
Maryland	10,564,304	3,414,456	7,149,848	3,024,050	390,406	5,184,622	1,946,976
Massachusetts	6,691,324	2,763,324	3,928,000	2,763,324	-	1,228,000	2,700,000
Michigan	23,444,698	7,199,941	16,244,757	7,199,941	-	16,733,280	5,511,477
Minnesota	19,499,139	6,298,706	13,200,433	6,298,706	-	8,281,655	4,771,563
Mississippi	19,431,609	7,393,017	12,044,592	6,753,314	639,703	10,253,408	147,215
Missouri	21,289,468	7,724,996	13,564,472	6,243,777	781,219	10,169,788	35,367
Montana	5,421,075	1,919,987	3,501,088	1,919,987	-	1,454,400	2,125,768
Nebraska	13,567,790	3,708,853	9,858,937	3,708,853	-	5,752,569	1,857,352
Nevada	2,856,136	921,615	1,934,521	921,615	-	1,826,993	3,431,831
New Hampshire	2,802,387	1,188,843	1,614,544	1,188,843	-	1,075,28	674,537
New Jersey	9,195,177	2,820,278	6,374,899	2,820,278	-	3,629,878	2,745,021
New Mexico	5,733,231	1,829,246	3,903,985	1,829,246	-	3,079,000	824,285
New York	29,762,380	8,690,794	21,071,586	8,690,794	-	5,722,000	13,549,586
North Carolina	32,067,780	11,222,364	20,845,416	10,442,240	1,078,124	15,102,016	1,800,000
North Dakota	7,286,586	2,536,275	4,750,311	2,536,275	-	2,570,197	243,400
Ohio	21,611,502	8,728,502	12,883,000	8,728,502	-	6,299,000	5,964,000
Oklahoma	15,694,141	5,052,847	10,641,294	4,563,691	489,156	6,929,702	930,000
Oregon	10,852,589	2,647,749	8,204,840	2,647,749	-	6,017,400	2,187,440
Pennsylvania	16,828,936	8,978,936	7,850,000	8,978,936	-	5,100,000	-
Puerto Rico	10,564,919	6,240,009	4,324,910	6,240,009	-	3,245,949	581,000
Rhode Island	1,610,557	960,201	650,356	960,201	-	584,356	66,000
South Carolina	16,745,686	5,929,867	10,815,819	5,381,517	548,350	10,658,319	100,000
South Dakota	6,171,409	2,589,902	3,581,507	2,589,902	-	2,418,357	1,147,114
Tennessee	18,995,297	8,447,570	10,547,727	7,653,285	794,285	8,277,487	2,054,079
Texas	42,083,881	13,292,355	28,791,526	12,314,680	977,675	20,834,350	7,781,336
Utah	5,459,490	1,148,341	4,041,149	1,418,341	-	2,227,335	536,239
Vermont	3,220,167	1,314,590	1,905,577	1,314,590	-	1,626,841	50,000
Virginia	26,139,158	6,913,253	19,225,905	6,234,645	678,608	14,500,000	4,725,905
Virgin Islands	8102,497	552,729	259,768	552,729	-	250,000	-
Washington	13,273,737	3,176,037	10,097,700	3,176,037	-	6,253,900	740,300
West Virginia	7,536,520	3,621,813	3,914,707	3,621,813	-	1,926,854	11,040
Wisconsin	23,533,599	6,322,088	17,216,611	6,322,083	-	9,936,276	181,967
Wyoming	3,517,737	1,155,124	2,382,613	1,155,124	-	1,660,099	722,514
American Samoa	526,842	526,842	N/A	526,842	-	Not Available at this time	" "
Micronesia	541,940	541,940	N/A	541,940	-	Not Available at this time	" "
Unallotted	2,053,664	2,053,664	-	2,053,664	-	-	-
GRAND TOTAL	744,798,803	248,61,000	496,737,803	237,261,000	10,800,000	334,897,236	142,390,519
District of Columbia	1,699,200	873,600	Act	825,600	-	-	825,600
1/ C. Public Postsecondary Education Reorganization Act	-	-	-	-	-	-	-

Table IV

COOPERATIVE EXTENSION AGENTS, BY ORGANIZATION CLASSES
(Staff-Year Equivalents)

Extension Workers by Organization Classes	Fiscal Year 1979	Fiscal Year 1980	Fiscal Year 1981
<u>State Workers:</u>			
Directors and Administrative personnel.....	487	493	508
Specialists.....	3,616	3,714	3,714
Total, State Staff.....	4,103	4,207	4,222
<u>County Workers:</u>			
Leaders and Supervisors.....	696	694	675
Area Agents.....	732	664	671
County Extension Agents.....	11,342	11,450	11,441
Total, County Staff.....	12,770	12,808	12,787
GRAND TOTAL.....	16,873	17,015	17,009 ^{a/}

^{a/} Estimate based on preliminary data available at the beginning of the fiscal year.

AGRICULTURAL PROGRAMS

Current Activities: The major goals of agricultural extension programs are to: (1) Assist agricultural producers, processors, suppliers, wholesalers and retailers, and others engaged in agriculture, and related endeavors to meet the food, fiber, and shelter needs of the nation, develop and maintain the U.S. comparative advantage in world trade and receive a fair share of the economic and social benefits. (2) Conserve and develop natural resources with special emphasis on soil, water, and energy. (3) Protect the quality of the environment from pollution by agricultural wastes and chemicals used in food and fiber production. (4) Enhance the ability of farmers and farm families to use available resources to improve their quality of life. (5) Help farmers and others involved in agriculture to understand and adjust to current federal, State, and local government programs and regulations, and to increase public understanding of the importance of a strong and viable agriculture.

Agricultural producers are the primary client group. Extension is particularly effective as a source of production information to commercial farmers, but evidence indicates that the program also is often used by other groups.

Growing demands from small farmers, home gardeners, and other non-farm people and demand for assistance with marketing and other problems constitute current challenges to the program.

The agricultural programs staff work with and through farm organizations such as the Grange, Farm Bureau, Farmers Union, National Farmers Organization, American Agricultural Movement, and various commodity organizations.

Selected Examples of Recent Progress:

Livestock and Veterinary Sciences: The Extension animal science program aims at improving production efficiency and insuring adequate food and fiber through development and transfer of new knowledge and technology that will reduce production costs and provide high quality animal and aquaculture products at the lowest possible consumer costs. Thus, Extension animal scientists provide programs to assist farmers to understand the economic and social advantages of adopting and incorporating new and improved ideas and technology and assist them to identify, select, and apply the best information, knowledge, skills, techniques, and experiences available for most efficient animal production.

Performance testing by U.S. beef producers, implemented by the Cooperative Extension Services resulted in a minimum of .05 pounds additional daily gain for slaughter steers and heifers in 1979. Projected nationwide, this amounts to 500 million pounds of additional live weight gain without additional feed resources.

A bibliography of "Horse Visuals and Publications" was published to answer frequent inquiries for information on horses. Similar publications are in production for beef cattle, sheep and swine. "Guidelines for Uniform Swine Improvement Program" had a major revision, and another "Guideline...", on beef, is being produced.

Sulfa Residue: A program to prevent sulfa residue violations in swine in 1979 undertaken jointly by Extension and the Food Safety and Quality Service, USDA, has resulted in a national decrease in violations from 15 percent to 4 percent. Some States formerly had violations as high as 27 percent. This drop in violations prevented the Food and Drug Administration (FDA) from withdrawing sulfa for use in swine production. The proper and effective use of sulfa in swine production can conservatively be estimated to add a billion pounds to the national pork supply without additional inputs.

Multi-State: A "Pork Industry Handbook", coordinated by Indiana CES, was produced cooperatively by industry and Extension specialists from many States.

Regional: Three regional "Beef Handbooks" were developed in 1980, one for the Great Plains (coordinated by Oklahoma), one for the South (coordinated by Tennessee), and one for the Northeast (coordinated by New York).

North Carolina: Extension-organized graded feeder calf sales in North Carolina provided an additional \$1.3 million to North Carolina Feeder calf producers in 1979.

Tennessee: The Tennessee Agricultural Extension Service in a demonstration of Integrated Reproduction Management (IRM) showed an improvement of 9 percent in calf crops over a 5-year period. Projecting this increase to only one-third of the Nation's beef cows, an increase of one million calves would result from implementation of IRM without significantly changing required inputs. Similar results have been obtained in Idaho, Kentucky, Minnesota, Ohio and West Virginia.

Idaho: Working with three ranches near Pegrarn, Idaho, an Extension beef management program helped cut death losses in young calves from a high of 22 percent in 1976 to less than 3 percent in 1979. Management changes and calving techniques applied included improved calving facilities, sanitation and nutrition, treatment of sick calves, closer observation during calving and herd vaccination.

Iowa: An effort by Iowa Extension is saving Iowa poultry producers \$1 million a year through a Mycoplasma meleagridis (MM) eradication pilot program for turkeys. The program, developed during 1979-80, is aimed at eliminating MM, a respiratory disease that is transmitted primarily by eggs. It is also responsible for late embryo mortality, skeletal abnormalities in young poult, poor liveability, and condemnations of fryer-roasters due to air sac lesions. In cooperation with the Iowa turkey hatchery operators and turkey breeder hen operators, the MM eradication program was inaugurated in one hatchery. Poult go from this hatchery to five breeder flocks where they produce more MM-free eggs for other breeder and commercial flocks. Extension monitors all flocks. Knowledge gained from this pilot program will be valuable in making Iowa one of the first MM-free States.

Catfish Farming: This high-investment, high-risk enterprise requires a high degree of management. In 1979, SEA-Extension funded a special project designed to provide new fish farmers with in-depth training in many phases of catfish farming. Some 186 Mississippi farmers, representing 16,356 new acres of catfish production, were trained in catfish farming. This new production will produce an estimated 48 million more pounds of catfish annually. Mississippi is the leader in catfish farming with more than 25,000 acres in production. Extension personnel at Prairie View A&M (Texas) established 166 catfish production demonstrations in 27 Texas counties during 1977-80. Approximately 350,000 small private ponds in Texas are owned by low income farmers, the primary audience for this program.

Plant and Pest Management Sciences: This program aims at improving production efficiency, with emphasis on increasing food and fiber production while assuring minimal adverse impact on the environment. These programs are designed to assist farmers and ranchers to increase agricultural productivity through efficient production of field and horticultural crops, forage, and pastures. Commercial agricultural producers are the primary clientele, although not at the expense of small, part-time farmers, urban gardeners and organic producers.

Pesticide Impact Assessment (PIA): The Pesticide Impact Assessment program provides accurate, objective data for evaluating the benefits of selected pesticides having critical agricultural and forestry uses. The selected pesticides are reviewed by the Environmental Protection Agency (EPA) to determine if their continued use poses hazards to human health and the environment. USDA, including SEA-Extension and the cooperating State Extension Services had established assessment teams for 31 pesticides. To date, 20 assessments are complete and 11 are in process. If use of the first 20 listed pesticides is cancelled by EPA, it would cost U.S. agriculture more than \$1 billion in crops lost to insects, weeds, diseases and other pests.

Pesticide Applicator Training (PAT): The PAT program creates an awareness among farmers, Extension personnel, State departments of agriculture, commercial pesticide applicators, and the public of the principles and importance of safe pesticide use and pesticide regulations. During FY 1980, the State Cooperative Extension Services trained some 295,000 commercial pesticide applicators (approximately 95 percent of the total). Another 2,090,000 private applicators, mostly farmers, (approximately 86 percent of the total) have also been trained. About 25 percent of these applicators will be retrained each year.

Integrated Pest Management (IPM): Since 1971, SEA-Extension and the State Cooperative Extension Services have pioneered new approaches to educating rural and urban users in the adoption of integrated pest management (IPM) systems in place of almost sole reliance on a single method of pest control. This has buffered both the costs of food to consumers and tended to protect the profit margins for producers. In addition, the environmental load of certain pesticides has been reduced and, in some instances, environmental quality has been improved.

North Carolina: North Carolina CES conducted a pilot project in 1980 aimed at giving pesticide dealers a better understanding of weed control through integrated pest management. Extension weed specialists held dealer meetings in 11 areas of the State, developed "Dial-a-Weed" (an 18" by 24" cardboard display that shows control programs for specific weeds) and held on-farm tours.

Mississippi: A high percentage of Mississippi cotton is scouted. There are 389 licensed private consultants who provide IPM services on about 800,000 acres. In addition, county programs sponsored by the Cooperative Extension Service provide IPM services on about 70,000 acres. Consultants, Extension specialists, and county agents cooperate on special area programs such as the Optimum Pest Management (OPM) program in Panola County and a 55,000 acre helothis (moth) suppression program in Laflore County. IPM practices have resulted in a large reduction in the use of pesticides on cotton. In 1972, 39,575,957 pounds of insecticide were used in Mississippi cotton. By 1979, insecticide use had decreased to 6 million pounds. IPM practices contributed to this high decrease. During the 1972-80 period, IPM cooperators have consistently used less insecticide to maintain higher yields than non-cooperators.

Georgia: Grower acceptance of IPM in Georgia is demonstrated by the program's growth. From the initial insect management effort on cotton, IPM programs have grown from two counties in 1972 to 57 counties in 1980; from one crop (cotton) to nine crops and home gardens: from insect

oriented programs to multi-discipline efforts involving all pests, plant development, and fertility. Scout training has developed from a cotton insect scouting school to a coordinated, full-season program involving multi-crop, multi-discipline schools; followup in-field training; fall and winter training sessions for those who train and supervise scouts; and a pilot program to train Pest Management Assistants employed in scouting programs. Enrollment in scout schools alone has increased from less than 50 to 1972 to 814 in 1980. From 38,000 acres of cotton in 1972, Georgia's IPM program has grown to include 249,206 acres of peanuts, soybeans, cotton, tobacco, pecans, lima beans, sweet corn, pimento peppers, and grain sorghum in 1980.

Grower contributions have increased from \$22,800 in 1972 to over \$660,000 in 1980. Perhaps the most significant accomplishment of the Georgia pest management program has been to encourage delivery of pest management services through the private sector. This has been most successful using independent scouts who have been trained and received experience in Extension programs. Independent scouts monitor a significant portion of Georgia's cotton acreage and are making inroads on peanuts, pecans, soybeans, and vegetables.

Kentucky: Kentucky's multidisciplinary, multi-crop pest management program, now in its third year, became an important part of the total farm management scheme for 497 farmers in 28 counties in 1980. These producers represented 146,315 acres and 4,203 fields of alfalfa, corn, small grains, soybeans, and grain sorghum, or five percent of the total crop acreage in the Commonwealth. Other farmers not in the program benefited from receiving timely pest alert information garnered from each IPM county. Kentucky's program will expand to 33 counties and approximately 201,000 acres in 1981, a 38 percent increase over the 1980 program.

Plant Pathology: Five State Extension Services--California, Colorado, Georgia, Minnesota and Wisconsin--are participating in demonstration projects in an effort to control Dutch Elm disease. Community demonstrations in these States helped reduce annual tree deaths from epidemic proportions to less than 5 percent of the total elm populations. Diseased elm firewood is being solar dried to prevent the spread of the disease, and communities are beginning to replace dead elms with other types of locally adaptable trees.

Agricultural Economics: The primary thrust of these programs is to improve the efficiency and profitability of family farms of all sizes. Objectives include improved farm business management and marketing decisions on the part of farm operators and increased efficiency of the agricultural marketing and farm supply system. Another major thrust is to improve the understanding by producers and consumers of the important public issues affecting production, marketing and consumption of agricultural products.

Computerized Management for Small Farmers: Minnesota farmers, including many small farm operators that borrow money from the Farmers Home Administration (FmHA), are learning farm management skills through a computerized national pilot project initiated by the Minnesota Extension Service in cooperation with FmHA. FmHA loan specialists in 37 Minnesota counties are being trained by Extension to use its computerized financial management program in evaluating their farm loan applicants. Some 700 Minnesota farmers have learned how to keep proper financial records and how to make future financial plans and cash flow projections. Many farmers with heavy debts and inefficient production have been able to bring their financial problems under better control.

Farm Credit: The Iowa Extension Service in April 1980, mounted a major educational effort to help farmers cope with the severe credit problems that hit when they needed credit to buy seed and fertilizer at planting time. Farm management specialists held 13 meetings around the State for 1,228 farmers, bankers and agribusiness. Ten newspaper and magazine articles were published by the media including Wallace's Farmer which blankets the State. Specialists also sent 4 radio tapes to 40-50 radio stations, made one television interview and participated in a 30-minute call-in radio show. This media blitz covered: current credit situation; short term outlook for credit and commodity prices; ways to cut costs for crop production; and cash flow planning method for the year.

Farm Income Tax: An Extension Advisory Committee on farm income taxes, with representatives from the four Extension regions, meets annually with the Internal Revenue Service (IRS) to revise the Farmers' Income Tax Guide and to discuss farmers' income management problems. For 1980, the committee was instrumental in persuading IRS to scrap its plans for a major revision of the farmer's tax form, 1040F. Many farmers use account books geared to the current 1040F, and to make major revision would further complicate their farm recordkeeping.

Transportation: Increased costs for agricultural transportation concern rural residents. A "Transportation Policy Primer," published by Oklahoma Extension Service, had help from Extension economists in 7 other States. The "Primer" examines the breadth and complexity of the transportation system serving rural America and provides a framework for evaluating alternative solutions to current rural transportation problems.

In May 1980, a Memorandum of Agreement between the Department of Transportation and SEA-Extension was signed. It calls for close cooperation between the two agencies in developing educational programs on rural transportation.

Soybeans: Two soybean publications were published in 1980 to assist farmers in assessing their soybean production costs. "Soybean Irrigation" includes worksheets for figuring irrigation costs and covers soil factors, irrigation management, pest management, energy requirements and other factors. "Cash Flow Planning for Soybean Producers" is a worksheet that takes producers through step-by-step cash flow planning.

Wheat: The Extension Wheat Industry Resources Committee, made up of industry representatives and Extension specialists from 10 States and SEA-Extension, produces educational material aimed at helping wheat producers with their production problems. In 1980, SEA-Extension in cooperation with the Nebraska Extension Service published "Jointed Goatgrass--How to Control It." Another publication, "Economics of Fertilizer Use" was printed in the Wheat Grower Magazine. Other educational materials have been developed to help wheat producers with forward pricing, hedging, storage, loans, grain pooling and other practices.

Direct Marketing: In North Carolina, \$50,000 provided by the Direct Marketing Act was increased by the addition of \$43,000 from the State. Consequently, 36 new clientele became involved in direct marketing plans including several pick-your-own operations for peaches, strawberries, blueberries, vegetables, and grapes. Part of this money was used to develop lists of pick-your-own locations and maps showing how to reach them. A mobile roadside fruit and vegetable stand was also built. In Illinois, sales from direct marketing have helped small operators and part-time farmers supplement their incomes, and to help State Extension specialists, a bibliography of direct marketing publications was published.

In Washington, D. C. the Cooperative Extension Service helped establish a "D.C. Open Air Farmers' Market" on Tuesday and Thursday, June through November from 1 p.m. to dusk. An average of 3,000 people participated each market day with 80% minorities and 40% of them low-income families. Prices on the average were 35% lower than conventional stores. Farmers averaged 75% complete sale of produce each market day.

Urban Gardening: The Urban Gardening program underway in 16 major metropolitan cities is aimed at providing low income families with a good source of fresh garden produce. In 1980, some 300 Extension specialists in the 16 cities and related State offices, and more than 2,600 volunteers worked with low income families in providing them educational materials and direct help in gardening, nutrition, diet, food preservation, and alternative use of free time. The program has also brought about community cohesiveness and has involved many youths. Value of the produce grown by nearly 200,000 participants was valued in excess of \$3 million.

In Washington, D. C., more than 5,000 families grew fresh vegetables on private, public and federal lands. Each family used about 400 square feet of land for a garden. Another 10,000 residents participated in backyard gardening activities with technical assistance from the Extension Service. More than 300 senior citizens participated at senior citizen centers and in rooftop gardening projects. Heavy metals are a concern to many gardeners. However, they are not a major concern in the Washington, D. C. area. Extension through its educational programs conveys this message to the gardeners and they continue to monitor heavy metal levels.

Small Farms: Who are the small farmers? About 52 percent or 1.2 million of the nation's 2.3 million farm families had total family net incomes from all sources (farm and non-farm) below the median nonmetropolitan level (about \$17,800) in 1980. About 3/4 of the average total family income of small farm families is from off-farm sources.

The \$2 million earmarked appropriation designated for Extension to use with "small and limited resource farmers and urban gardening" serves as a base for Extension small farm programs. This sum was first designated in 1975 by Congress to give priority to the small farm problem. The appropriation averages about \$58,000 each for the 1890 land grant universities and Tuskegee Institute and \$19,000 for the 1862 Land grant universities. Since this funding alone is not enough to add adequate staff and/or new programs of the scope needed to solve the problem, State Cooperative Extension Services have redirected and added other federal, State and county funds in order to initiate the conduct of more effective small farm programs. For example:

California: The California Extension Service is establishing a "small farm information center" to get tailored information in Spanish and English directly to small farmers through small farm resource centers.

New England: The New England Small Farm Project is a new partnership effort of Extension in the six states of Maine, Vermont, New Hampshire, Connecticut, Massachusetts and Rhode Island with the staff in Massachusetts giving leadership to this special effort. Progress the first year includes a newsletter with a circulation of 1,800 and sponsoring workshops, such as the one on sheep in Rhode Island attended by 400 people.

Missouri: 1,761 families enrolled in the Extension small farm family program increased net income per family an average of 18 percent.

Alabama: 43 limited resource farmers on demonstration farms averaged \$9,090 net farm income and \$3,407 non-farm income in 1979 compared to \$4,049 net farm income and \$2,953 non-farm income in 1978.

Extension is cooperating with other USDA agencies with field offices, and with ACTION and the Community Services Administration in 17 Small Farm Family Assistance Projects in an effort to focus redirected funds on a specific target area of small farm families to better serve them. In a continuing and increased effort to reach more small farm families, most States now have a Small Farm Committee to work with SEA-Extension and other agencies and organizations on small farm projects. Some States are also organizing County Small Farm Committees which include small farm operators to help suggest and conduct programs at the county level.

Public Policy Education: The national Extension project on foreign trade policy, coordinated by the Minnesota Cooperative Extension Service, prepared two publications on the advantages and needs of U.S. agriculture in international trade. As part of project activities last year, four regional workshops were held to discuss international trade and policy issues. Economists from the State land grant universities and USDA are participating in the project.

The publications, issued by the Minnesota Agricultural Extension Service are: "Speaking of Trade" and "Agricultural Trade: Key Issues for Farmers," (a packet of 12 leaflets). Some 12,000 copies of each of the publications were distributed. The Foreign Agricultural Service distributed "Speaking of Trade" to agricultural attaches throughout the world. It won the 1979 Quality Publication Award of the Agricultural Economic Association.

The regional workshops, in Boise, Idaho; Minneapolis, Minnesota; West Lafayette, Indiana; and Nashville, Tennessee, were attended by agri-business leaders, bankers, farm organization leaders, Extension administrators, and public policy specialists.

Agricultural trade programs for State leaders were held in Oregon, Washington, Ohio, and Illinois. In other states, agricultural trade issues were discussed at public policy education meetings.

Agricultural Engineering and Safety: With worldwide attention being focused on energy, so have Agricultural Extension Engineering efforts. These programs are aimed at helping farmers squeeze as much energy as possible through increased use of fossil fuels. Extension is working with agricultural producers in the use of solar energy, more efficient use of other energy sources including minimum tillage, and the production of alcohol, methane, and other alternative fuels.

Concern for the safety of agricultural workers, their families, and rural residents has increased because of hazards associated with increased mechanization and increased regulations through safety standards. Extension safety programs are working to help farmers, home owners and others know and appreciate the value of these programs.

Energy Centers: Two regional agricultural energy centers go under way in the last three months of FY 1980. The center at Peoria, Illinois is concentrating on the production of energy-potential crops like corn for alcohol, sunflowers for oil and the conversion of biomass to fuels. The center at Tifton, Georgia is concentrating on on-farm energy systems with emphasis on solar heating and grain drying.

A seminar in September at Peoria brought together experts on fuels, including one of the world's leading authorities on the use of vegetable oil as diesel fuel.

Because of the seminar, standards are being developed for testing vegetable oils and the Peoria energy center--and the Northern Regional Research Center (SEA-AR) also at Peoria--are becoming recognized nationwide as information centers on biomass research. Extension professionals at each center are providing coordination and development of Extension information with researchers, conducting training and tours, and consulting with State Extension specialists and others on energy programs and needs.

Solar Energy: Agreements were completed with the Department of Energy (DOE) during 1980 to provide \$1.05 million to SEA-Extension to continue a solar heating of livestock building demonstration program and to initiate an on-farm solar drying of crops and grains demonstration program. The livestock building program, in its second year, involves about 90 farms in 9 States. In Nebraska, thanks to solar energy, a participating hog farmer's heating costs averaged only 7 cents a day last winter, and that was primarily to run an exhaust fan. In Missouri, a turkey farmer cut his L.P. gas usage from 60 gallons per day in 1978-79 to 30 gallons per day in 1979-80 using solar energy.

Farm Safety: In Nebraska, the Extension agricultural engineer has trained more than 7,500 Nebraska emergency medical technicians since 1976 in extricating victims from accidents involving farm machinery. As a result of this training and other safety programs in Nebraska, a 10-county area in the southwest part of the State has had no fatal farm accidents in 3 years. In FY 1980, Extension agricultural engineers have trained 135 emergency medical technicians in Iowa, 85 in Louisiana, and 211 in South Dakota in approved methods for extricating farm accident victims.

From the latest statistics available, the annual number of accidental deaths in Nebraska was reduced from 70 in 1965 to 33 in 1977. As of October 1980, there had been 27 deaths. In 1965, 26 (of 70) deaths resulted from tractor overturns, while only 6 deaths have been attributed to tractor overturns as of October 1980.

In California in 1976, an insurance carrier received a dividend of 29.8 percent on worker's compensation insurance. In 1977, the dividend jumped to 42.2 percent, indicating the reduction in the accident rate. California has an active farm safety program that has helped cut the accident rate.

Agricultural Weather: Agricultural weather programs, in cooperation with the National Weather Service (NWS), are operating on a pilot basis in 12 States. Volunteers in this effort provide daily weather information directly to NWS computers by touch-tone telephone. These data are then instantly available to NWS forecaster and Extension specialists. In North Carolina, Extension is determining how to most effectively develop joint NWS-Extension releases for farmers to assist in making day-to-day production decisions. In Kentucky, a wide variety of weather information is displayed graphically on the "Green Thumb" dissemination system. This pilot project is operating in Todd and Shelby Counties of Kentucky with 100 farmers participating in each county. Evaluation of the project is expected to begin in early 1981.

Mount St. Helen's: Washington State Extension Service conducted a public information program to help citizens of that State cope with problems created by the eruption of Mt. St. Helen. The Washington State information staff is: developing a chapter for the Disaster Handbook (a handbook used by all State Extension Services to aid in disaster programs); surveying farmers to learn how they got their agricultural information on handling volcanic ash; surveying the media to learn where they got their agricultural information and how they used it; and surveying other State and federal agencies involved in the ash program on how and where they got their information. The Information staff has, since the May 18 eruption, issued weekly "Ash and Agriculture" updates containing information on conditions and problems in ash fallout areas. In addition to this report, many press releases and radio-TV tapes have been issued to the media outlining the steps people could take to cope with the ash.

NATURAL RESOURCES

Current Activities: Natural Resources programs account for about 3 percent of Extension's professional staff time. Current areas of emphasis include management of forests, rangeland, fish and wildlife, outdoor recreation, the environment, and public policy. Natural Resources' major accomplishments were preparing and submitting to Congress a 5-year plan to implement P.L. 95-306 (the Renewable Resources Extension Act of 1978), and program leadership to State Extension Services.

The 5-year plan was coordinated with the Resources Planning Act (RPA) and the Resources Conservation Act (RCA) of the Forest Service and the Soil Conservation Service. States submitted preliminary State renewable resource plans. The 5-year plan will guide State renewable resources program.

The Natural Resources staff provided leadership to State Extension Services in forestry, wood products, wood for energy, fish and wildlife, range, environmental protection, outdoor recreation, and continuing education.

Selected Examples of Recent Progress:

Forest Land Management

Southern Region (13 states): To assist in more orderly marketing of standing timber in the South, the Southern Regional Extension Forester has made timber price information available in every county Extension office in the South. This program is in cooperation with the Forest Service.

Indiana: Purdue Extension foresters conducted pesticide use training. In the pre-test, only 17 percent received passing grades. After the training, all trainees received passing grades. The program taught foresters and other land managers how to use forest chemicals safely and effectively.

Texas: Extension foresters taught owners of native pecan woodlands how to manage for nut production and timber. Six thousand acres were improved, resulting in an estimated increase in income of \$1.8 million to landowners.

Kansas: Extension conducted a series of fuelwood workshops targeted to landowners and consumers. They emphasized the use of fuelwood to improve forests for timber and other forest values, such as wildlife, aesthetics and watershed protection. Individual workshops attracted as many as 300 participants.

North Carolina: Logging workshops taught production and cost analysis, decisionmaking, and business management. Loggers used video tapes and mini-computers for time-study analysis of logging operations. The program reached loggers who account for 55 percent of the production in each area, and attendees estimated they could increase productivity 5-10 percent.

Wood for Energy

North Carolina: Three brick companies, a textile plant, and a public school were helped to convert to wood as a fuel. Several other organizations in the state plan to use this alternate energy source. These companies are using wood to replace the equivalent of approximately 8 million gallons of oil a year. This represents a savings of approximately \$5.5 million in fuel costs (based on 1980 oil and wood costs).

Wood Products

Louisiana: The Cooperative Extension Service, working with the Forest Service and using research conducted by the Wood Products Insect Laboratory and the Forest and Wood Product Disease Laboratory, Gulfport, Mississippi cooperated in a statewide public information and education mass-media campaign (radio and televisions) to create awareness of wood decay and insect damage to homes. The Louisiana Extension Service trained its county agents to respond to the requests which the mass-media campaign generated. During the campaign, 382,993 brochures were disseminated. Forty-eight percent of the State's population recalled the radio message. Sixty-four percent of the respondents found the brochures helpful. Much of the present damage by decay and insects need not take place. The program is being extended to other southern states.

Rangeland Management

Wyoming: Extension workers taught principles of range management on Federal lands to citizens. This improved understanding of the ecological relationships involved in livestock management on rangelands will enable the public to participate effectively in policy decisionmaking.

Kansas: A rangeland fire behavior short course teaches county agents, SCS conservationists, and others how to use prescribed burning safely and effectively. Periodic burning is necessary to maintain a healthy, tall prairie grass ecosystem.

Oregon: More than 150 people attended Extension workshops on sagebrush "management." Knowledge of species and subspecies is now recognized as a key to reconciling differences in management responses. Sagebrush is the dominant shrub species on many millions of acres of rangeland in the western United States.

Fisheries and Wildlife Management

Vermont: Wildlife populations are responding to wildlife habitat improvement brought about through an Extension education program for 5th and 6th grade school children and their teachers. Some of the benefits are increased deer population and reduced beaver damage.

Tennessee: During 1980, a total of 8,184 boys and girls received information about wildlife management at three 4-H training centers. One hundred and seventy-five delegates to the annual Tennessee 4-H Wildlife Conference scored well on a comprehensive examination. 4-H youth planted 455 wildlife food plots.

Pennsylvania and Oregon: The Cooperative Extension Service helped farmers deal with bird damage. Use of bird repellent increased yield of cherries by 7 percent, or 500 pounds per acre (harvest values of \$250 per acre). Frightening devices in oat fields saved \$500 in yield. Use of electric fences reduced sheep losses from coyotes and dogs, demonstrating an effective and environmentally acceptable method.

Arkansas: The Cooperative Extension Service encouraged landowners to improve wildlife habitat by planting 70,000 seedlings of wildlife food-producing trees and shrubs, and more than 4,000 one-quarter acre wildlife food plots.

Mississippi: The catfish industry benefits from several hundred early and accurate diagnoses of fish kills by Extension specialists. Maintaining water quality in catfish ponds saves hundreds of thousands of dollars each year. Extension workshops reached 184 catfish farmers, who represented 5,659 acres of ponds, with an additional 16,356 acres planned. Catfish farming can net as much as \$800 per acre.

Georgia: The Cooperative Extension Service provided marketing information to potential investors in earthworm enterprises, helping some to avoid losses they otherwise might have incurred.

HOME ECONOMICS

Current Activities: Extension home economics educators helped nearly 30 million families deal with inflation, energy, nutrition and health, and family-related problems in FY 1980. (This figure represents direct contacts and does not include the millions of mass media contacts.) About 22.8 percent of Extension's professional staff time is spent on home economics Extension programs. Nearly 4,000 home economists, assisted by approximately 600,000 volunteers and 4,000 paraprofessionals, conduct these programs to help families identify their needs, make improved decisions, and use and conserve their resources to achieve a desired level of living.

A 1979 Evaluation of the Home Economics program found that (1) more than 4.5 million persons received family education; (2) over one-half million (600,000) Extension Homemakers provided leadership and extended Extension education (25,000 years of volunteer leadership in a 12-month period reaching 2 million adults and a million youths); (3) almost 6,000 home Extension advisory and program development councils composed of 90,000 members nationally assisted Extension Home Economists. A Gallup Poll showed that 17 million persons (10% of the adult population) participated actively at least once in some aspect of the program, and that both women and men participated. Eighty-five million adults had received Extension materials (this did not include the millions receiving information by radio and TV) and Extension Home Economics staff cooperated with 250 different agencies, groups, and private organizations.

Extension educators use methods such as mass media, computer-assisted programs, dial access programs, correspondence courses, exhibits, newsletters, group meetings, and personal contacts. Their target audiences include young families, low-income families, the elderly, the handicapped, minorities, Extension homemakers, youth and leaders who extend Extension's educational program to others. New, expanding audiences include expectant parents, pregnant and nursing women, single parent and male homemakers, teachers and food purveyors.

Federal, State and county Extension home economics staffs cooperate with a wide range of other agencies and institutions to assess needs and plan and implement programs. These cooperative efforts are with local health departments, agricultural commodity groups and local businesses. They also include staffs involved in Food Stamp programs, the WIC program and programs for feeding the handicapped and the elderly.

The most urgent problems of families as identified in State Extension Plans of Work, relate to food and nutrition; family resource management; energy; housing and home environment; and human development and parenting. New and intensified problems can be seen in the social, economic, environmental and health trends for the 1980's. Both education and research bases of SEA must be expanded and updated to meet these urgent needs in the next five years.

For administrative purposes, Home Economics programs at the Federal level are divided into Family Education programs and Food and Nutrition programs.

FAMILY EDUCATION: SEA-Extension professionals in Family Education provide leadership to CES home economics programs that help families cope with major problems such as inflation, energy costs and conservation, human development and parenting, lifestyle changes and maintenance of health and safety in the home. Liaison is maintained with CES home economics specialists in housing, home furnishings, household equipment, clothing and textiles, family resource management, family life, health/safety, etc. There are increasing consumer demands on Extension staff to provide help on a broad range of problems. Staff in many urban areas, for example, have had to discontinue offering consumer publications through the mass media, as the response has overwhelmed the ability of staff to respond.

Selected Examples of Recent Progress:

Family Resource Management

Michigan: The use of computers for program delivery in Michigan was initiated Statewide in 1976 with over 80 percent of the Extension staff involved in training. Since then the number of programs available for clientele use has expanded and annual staff training has been provided. Programs include: Dollar Watch: Steps Into Spending; Budgeting for Retirement; Dollar Stretcher and others in the areas of money management and food buying. Within this program year a comprehensive hardware system (CDMNET) will become operational, achieving continuous county access to a central computer facility.

Kentucky: Kentucky home economics Extension staff are participating in that State's "Green Thumb" project. In addition to computerized weather information, viewers in the test area can now dial up information on food buying, nutrition, health, inflation-fighting tips, etc.

By pushing a key on the "Green Thumb" box and dialing a local telephone number, participants can contact a computer which selects information from a "menu." The selected information then appears on the home TV screen. Two hundred families are participating in this test.

Idaho: An Idaho CES computer budgeting program titled "Speedy Spend" provides individual and family budget analysis with followup counseling for clients. Begun in twelve Idaho counties in 1979 and projected for 27 counties in 1980, processing centers are located at supermarkets and shopping centers. Clients and staffs of health, welfare and other local community groups and agencies are encouraged to participate. Emphasis is on living within one's means.

Over 3,200 persons/families benefited from this program by better understanding their income in relation to their needs and desires. Clients say they have reduced debts and attained better control of their money.

Montana: A correspondence course called "Estate Planning for Every Montanan" which includes ten lessons on everything from life insurance to federal or State estate taxes is proving successful in Montana. Over 12,000 Montana citizens in all 56 counties have participated.

The University of Montana School of Law purchased 1,000 copies of the course to distribute at meetings for senior citizens.

Agents in isolated, single-agent counties appreciate the completeness of the course which can easily be mailed out. In more urban settings, agents have offered the course to thousands of participants and followed it up with a series of public meetings. Some agents have a waiting list of people who want to take the course.

Connecticut: In New Haven County, Connecticut, the Extension home economist used mass media to reach 850,000 residents with a consumer education program. The program was conducted with two-minute TV spots at noon three times a week on commercial television. An estimated 71,000 people were reached through 350 radio programs on four local radio stations, newspapers and newsletters. Topics included buying skills, universal product codes, smoke detectors, buying and maintaining equipment, upholstered furniture, making your own cleaning supplies, and legal services. Some 8,000 requests were received for 10,000 pieces of information material. Program questionnaires were sent to those requesting information. Testimonial behavior changes were received and recorded.

District of Columbia: A total of 52,815 persons participated in one or more of the following D. C. Cooperative Extension Service programs in 1980; Textiles and Clothing; Personal and Family Resources Management; Housing and Home Environment; Family Relations and Human Health. Approximately 600 families are using energy saving techniques as they relate to the use of small appliances.

South Carolina: Do-it-yourself projects in South Carolina included refinishing and reupholstering furniture, hanging wallpaper and making accessories. In two counties 1,295 items have been completed and in one county 8 individuals are earning incomes as a result of new skills acquired. To date a total of 4,097 individuals have participated in one or more projects.

Kentucky: Kentucky's Home Energy Analysis Program (CHEAP) provides an analysis of the economic feasibility of adding insulation, storm windows and doors to an existing structure. This is a free computer analysis available through the Cooperative Extension Service and the Kentucky Department of Energy. Three thousand homes have been analyzed and surveys indicate 30 percent of these homes added insulation as a result of CHEAP resulting in a savings of \$288,186 in energy costs. CHEAP and related educational information has reached 1,120,000 households in Kentucky. Fifty-two percent of households completing CHEAP had no previous contact with Cooperative Extension Service.

Missouri: Through the small farm program conducted by Lincoln University and the University of Missouri, over 1,875 families improved their economic and social well being by increasing their knowledge and skills in the management of family resources. Participating families reduced energy costs by adopting recommended practices such as: adding insulation (243 families) caulking, weather stripping, etc. (727 families). As a result of these home weatherization practices, the energy cost savings ranged from \$33 to \$300 per family.

Colorado: A Weld County, Colorado home economist designed an energy saving house which was then built as a demonstration model. Solar heating and many other energy saving features, equipment and furnishings were used. The demonstration house has been used to show home builders, architects and potential home owners the conservation features. The total annual gas bill was \$128 and the electric bill was \$170. Television, radio and newspapers have featured this energy saving house.

Louisiana: Nearly 90,000 of Louisiana's second graders saw "Enerjean" the clown last year. They learned simple but important energy conservation concepts that could also be shared with their families.

There are over 300 Louisiana "Enerjeans"--all Extension homemakers and volunteers. They were trained by CES in energy conservation and also in clown make-up, costuming and showmanship.

The "Enerjean" clowns hand out coloring sheets with pictures of "Enerjean" to the children. They also entertain (and educate) at shopping malls where they reach adults as well as children. The clowns are backed up by a Statewide energy education program conducted by Extension staff through mass media and other methods.

Iowa: What was going to be a one-time energy exhibit in Iowa has turned into a Statewide event

An energy exhibit was designed for a 1977 Farm Progress Show near Washington, Iowa at which people would, with the help of a computer conduct an energy audit on their homes. Participants filled in a simple questionnaire giving data about their homes. Within minutes, they had a printout that would help them see how possible improvements would help them save energy and money.

The 1977 Iowa Farm Progress Show attracted 300,000 people and many lined up, day after day, to get their Extension energy audit. After the show, Extension geared up to take the show all over the State. Financial support came from the Iowa Energy Policy Council, builders' trade association, savings and loans institutions, and shopping mall associations.

To date, Iowa Extension energy exhibits have been shown in 204 locations and nearly 9,000 people have received an energy audit. Over 27,000 people stopped to ask for information at the exhibits, 45,000 people picked up energy publications and an estimated 150,000 persons stopped to view the exhibits and display materials.

A random sample of 120 Iowa residents who had their homes audited showed that 65 percent had made one or more energy improvements since the completion of the audit.

Human Development and Parenting

Washington: Cooperative Extension in the state of Washington has focused programs on parent education for low-income families. The strategy was to provide home base training for parents and professionals and paraprofessionals involved in child care. Eight-five families in Yakima County participated and a follow-up study showed that as a result of this training, 1,060 persons benefited when the multiplier effect was considered (those who were originally trained shared their learning with others).

A six-month random follow-up telephone survey of those benefiting from the program indicated that 76 percent of the people were conscious of changes made in their parenting behaviors. The most frequently mentioned changes were: better discipline, how to teach children (punish less, praise more), more understanding and individual recognition.

In another program thrust, emphasis was given to helping school-age parents. This group is at the highest risk in parenting. Using information provided through an informal network, a special newsletter was prepared and sent monthly to school age parents.

The newsletters focused on parent education, especially as it related to the first two years of a child's life. They also covered personal challenges confronting the parent, such as the importance of getting back into school, selecting child care and other relevant topics. The newsletters were well received and several States have requested permission to reproduce them.

In a spinoff of this effort, HHS, the March of Dimes, and the Cooperative Extension Service jointly sponsored a conference for professional inservice training on parenting. Professionals from Oregon, Washington and California participated. Another conference, planned for June 1981, will involve 10 Western States.

South Carolina: In connection with the White House Conference on Families, each county in South Carolina held a meeting designed to bring together concerned citizens with the task of identifying the six top problems related to families in the State. The results of these county meetings were used to identify the top 10 concerns at the State level as reported to National White House Conference on Families Office.

Utah: Extension personnel were highly involved in WHCF activities in Utah. The Governor appointed a County Extension Agent, the Superintendent of Schools and a County Commissioner as a committee responsible for considering hearings in each county. Forty-three hearings were held throughout the State. A Statewide conference on families was held to explore ways to strengthen Utah families.

Illinois: "Think Children" was the theme of a family centered program developed in Piatt County, Illinois. A total of 83 programs were held during the year. These were supplemented with radio and TV programs, a weekly newspaper article and a monthly schedule of events.

Local organizations and nearly 900 people participated in planning projects. The Mayor joined in by declaring "Reading Is Fun Week."

Programs were aimed at fathers, single parents and working parents. The fact that many agencies worked together to reach a common goal was a strength of the program. Future cooperative program efforts are being planned.

Health and Other Family Related Problems

Kentucky: At least 90 percent of Kentucky counties have participated in blood pressure screening and personal health conservation programs conducted by Extension personnel. Over 377 educational sessions on physical fitness, career education and immunization reached 11,656 people. Over 1,000 radio programs and 1,387 news articles on health education were produced.

Texas: More than 14,300 adults and youths participated in Texas CES health fairs to learn positive health practices and acquaint themselves with services available in their communities. In one county 650 people were screened; 131 had abnormal readings and were referred to a physician.

North Dakota: Some 250 Extension Homemaker club members were trained by the Extension Farm Safety leader to conduct the farm safety survey - a joint activity of USDA and the National Safety Council. Over 1,000 families were surveyed.

Maryland: Frederick County, Maryland has over 300 patients in mental hospitals. Many could be released if they had access to a support system. An Extension agent was selected chairman of an interagency committee to work on a resocialization center for the psychiatric patients. Extension contributes programs on clothing, care, construction and mending, basic nutrition and good grooming. To date, 100 patients have passed through the center; the 97 percent rate of return to mental hospitals has been cut to less than half, and one-third of the clients have secured jobs. Another third are living on their own.

Helping Consumers Cope With Housing Problems

Puerto Rico: A Puerto Rican Extension home economist counseled 687 HUD housing consumers on pre-rental and post occupancy concerns and ways to prevent foreclosure. Based on a HUD review of the impact of this program, the Extension office was recertified as a HUD counseling agency for another year.

Pennsylvania: In Pennsylvania 500 families in 13 counties were reached with housing decision information by CES programs. This reflected a direct impact on \$25 million in housing expenditures. In one county 50 percent of the attendees investigated sources of loans and 37 percent chose to remodel their existing homes.

West Virginia: In a West Virginia CES program, 7,245 women learned to repair leaky faucets and, based on an average value of \$15 per repair, the 10 percent who reported using the information, saved \$11,000.

FOOD AND NUTRITION: Programming in Food and Nutrition is geared to families and individuals from all cultural, racial, and socio-economic backgrounds to help them evaluate food choices; plan meals; and manage money and energy resources to procure and prepare foods.

In many areas of the country, the local Extension office is the only source of information related to human nutrition and the only source providing current, research-based information on human nutrition that people can use to make decisions on how to eat to maintain good health.

Extension professionals are in a unique position to observe the effects of food and nutrition policies on food consumption. These observations are fed back to other agencies to provide information useful in adjustments of food policies and in development of nutrition programs to meet the needs of local people.

Improving health by selecting foods wisely has been a major part of SEA-Extension's Food and Nutrition programming during the past year. Program emphasis has been placed on helping people understand and use the dietary guidelines.

Selected Examples of Recent Progress:

General Nutrition Education: Extension staffs in every county and State are recognized as authoritative sources of home food preservation information. Extension professionals conduct demonstration meetings on preservation techniques. Food safety is an integral part of these programs. Many States and counties have special telephone systems to handle the flood of calls during the height of the food preservation season.

Maternal/infant nutrition is a vital health issue affecting women and children of all socio-economic levels. It is generally accepted by health professionals that a woman who is well nourished prior to and during pregnancy will probably have an uncomplicated pregnancy. There was a gradual decline in infant deaths of 16.6 per 1,000 live births in 1974 to 13.6 per 1,000 in 1978. These statistics reflect improved nutrition and prenatal health care from the cooperative efforts of such agencies as local departments of health, the Extension Service, and the WIC program.

Colorado: Incorporating the USDA-Department of Health and Human Services Dietary Guidelines into its ongoing Healthy Heart program, Colorado this year is making heart disease prevention its major nutrition education thrust. Twelve workshops training 240 educators on heart disease and diet have been held. These nutrition educators in turn are reaching about 1,200 adults through 80 community programs. Colorado's program next year will include teaching Healthy Heart information to State high school students. To do this, Extension staff are collaborating now with school physical education staffs and teachers of health and home economics.

Jointly with the Colorado Migrant Council of HHS, Colorado Extension Service has produced slide tape modules in English and Spanish based on the Dietary Guidelines. The modules are available to other State Extension Services.

Mississippi: A Weight-off-Wisely program was taught to 3,124 people in 145 groups. The groups met for 16 weekly lessons. The program included nutrition principles taught by nurses and physicians. Average weight loss was 10-15 pounds for those completing the classes. Clients reported a range of program results such as achieving weight goals, reduced blood pressure, annual savings of up to \$350 by reducing medications, and annual savings of up to \$75 by cutting back on snack food. There is such interest in this program that there are waiting lists for new classes.

New York: This year New York Cooperative Extension Service has reached state grocery shoppers with information on complex carbohydrates in foods through a well coordinated mass media blitz entitled "Food for Health: the Carbohydrate." The 16-week campaign included 16 feature articles sent to cooperating newspapers, radio public service announcements aired over 26 stations, four television public service announcements, four 14 1/2-minute programs carried over cable television, and point-of-purchase promotions through two supermarket chains. Extension home economists used shelf talkers, recipe cards, large displays, and eight folded fact sheets to grade shoppers' attention in

the stores. The home economists explained the cost advantages and nutritional value of such food as rice, whole wheat bread, oatmeal, vegetables dry beans, and lentiles. They stressed the advantage of using these foods and decreasing consumption of high-sugar, high-fat foods.

Texas: Focus was on practical use of dietary guidelines in meal planning, shopping and food preparation. In-depth programs were conducted in 60 counties via telephone, direct mail, seminars, demonstrations, office and home visits, and diet-check computer analysis. Professionals from local agencies and institutions participated. The program helped 150,992 people improve their eating habits, 20,000 people make progress in weight control, 72,595 people improve buying practices, 56,491 food stamp recipients improve meal planning and budgeting, 44,565 people improve food safety practices. Some 13,843 older adults were taught more efficient food buying, with many reporting savings of \$10-15 per week.

Minnesota: Extension specialists have developed a series of courses to promote food safety in the food service industry. The need for sanitation training is great in this industry because many workers have not had adequate training and there is high worker turnover. The risk of causing illness is high because each food service establishment is in contact with hundreds of people daily. Special courses have been developed for owners, managers, cooks, and workers. The courses include information about the causes of illness by foodborne organisms, recipe design, management action, and policies for preventing illness caused by foodborne organisms. More than 1,000 people have been trained in the three years the program has been in operation. Students must pass an examination to become "certified." The Minnesota Extension staff has worked closely with public health personnel and the Minnesota Restaurant Association to make this a successful program.

District of Columbia: Approximately 6,000 shoppers were reached in D. C. supermarkets in a nutrition project shared by Giant Food and Safeway Stores Food Stores and D. C. area Extension Home Economists during the month of March 1980. Over 2,000 school age youth participated in a special nutrition project in public schools during Black History Month (March). Nutrition 30 - second spots are being aired on WJLA-TV (Channel 7) and reach an estimated audience of 800,000.

New York: About 1,100 parents and people who care for children were trained in a program to improve the food habits of preschool-age children. Child care providers reported an increase in serving nutritious snacks and a decrease in serving nutritionally poor snacks to young children. There also were increased nutrition education activities in a 6-month nutrition education workshop with food preparers, parents, and children.

Adult EFNEP: The Expanded Food and Nutrition Education Program (EFNEP), implemented by the USDA and the State Cooperative Extension Services in 1968, has made it possible to expand food and nutrition education to low-income families. Para-professional program aids, supervised by Extension home economists, teach families on a one-to-one basis and in small group meetings.

Sixteen EFNEP Food Stamp Projects are testing innovative methods to increase participation in EFNEP by families receiving food stamps, recruit families, measure new delivery modes and teaching approaches, train staff, and evaluate programs.

More than 1.8 million low-income families, representing 7.5 million family members, have been enrolled in this program since 1969. The program emphasizes enrolling homemakers with young children. Currently, 4,833 program aids, trained by home economists, are employed to reach families in about 1,000 program sites. Families are taught to improve their diets through increased knowledge and improved practices of nutrition. EFNEP increases the ability to select and buy food, prepare and serve balanced meals, and to manage resources such as gardens, food stamps, and other food programs.

Georgia: In the Georgia EFNEP Food Stamp Project an experimental study developed and is currently evaluating alternative recruiting strategies and methods of educating food stamp recipients. These methods include posters, public service announcements, mailings, mobile units in grocery store parking lots and an educational TV series. Promising ideas are developing regarding the best way of enticing food stamp recipients into an educational program and the most effective way to change food-related behavior once they are enrolled.

California: The California EFNEP Food Stamp Project is evaluating the effectiveness of a Spanish language TV series to reach and teach Mexican/American populations in two counties in California's central valley. The TV series is broadcasted by a Spanish language station. Viewers who enroll in EFNEP receive written material to supplement the TV presentation. The TV classes are conducted over a six month period by an EFNEP staff member and the TV host. The research design employs four comparison groups: TV series only; one-to-one teaching and no TV; one-to-one teaching plus TV instructions; and a control group.

Michigan: The Department of Social Services returned 187 children from 75 families to their homes after home conditions improved and the homemaker was enrolled in the EFNEP Program. Returning the children home saved the State an estimated \$7,100 in foster care payments each month.

4-H YOUTH DEVELOPMENT

Current Activities: The primary purpose of 4-H is to assist youth in developing knowledge and skills that will enable them to become self-directing, productive and contributing members of society.

4-H programs involve youth, volunteer leaders, the Cooperative Extension Services, and the private sector. Parent involvement in 4-H is important to its success.

Approximately 28 percent of Extension's professional staff time is devoted to 4-H youth programs. Current areas of emphasis in 4-H youth programs in all States include:

- Food and fiber production, processing, marketing, and consumption
- Foods and nutrition
- Conservation and wise use of energy resources
- Environmental improvement and conservation of natural resources
- Career exploration, youth employment, economic understanding
- Community development, leadership and citizenship
- Health and safety
- Consumer education
- Preparing youth for family responsibilities
- Leisure education

Total youth participating in 4-H programs last year was 5,078,022 compared with 5,234,342 in FY 78. Decreased enrollments were reported in organized 4-H Clubs, 4-H instructional TV, and in 4-H Expanded Food and Nutrition Education Program (EFNEP), while enrollments in 4-H special interests units continued to show gains.

	<u>1978</u>	<u>1979</u>
Organized 4-H Clubs	2,090,798	1,994,207
4-H special interest units	2,070,161	2,135,316
4-H EFNEP	651,163	639,103
4-H TV	432,220	309,396

Approximately 60 percent of the youth participating in 4-H last year came from farms and towns under 10,000 and open country. Specific gains in geographic participation were reported in youth from towns and cities with populations from 10,000 to 50,000 and in the suburbs of central cities with populations over 50,000.

Selected Examples of Recent Progress:

Food & Fiber Production, Processing, Marketing and Consumption: More than 1,900,000 young people have been involved in projects related to the production of crops and livestock with an additional 1,100,500 participating in projects related to machines and equipment.

The cash value of the livestock, handicraft projects, foods and other material items produced in completing these projects is estimated at nearly \$220 million. Other benefits from the projects are related to the development of life skills, promotion of better health, prevention of crime, better use of leisure time, more effective consumer decision making and appropriate selection of careers.

West Virginia: In West Virginia over 5,000 youth were enrolled in 4-H livestock production projects last year. Major livestock production efforts centered on beef feeder calf and dairy heifer replacement programs. Approximately 1,000 beef feeder calves were sold by 4-H members, grossing an estimated income of approximately \$300,000. The dairy heifer replacement program continues to grow, and makes up about 80 percent of West Virginia's 4-H dairy program.

Illinois: 4-H X-tra Yield Program 4-H'ers in Livingston County exceeded the county corn and soybean production average. The 4-H'ers averaged 148 bushels of corn and 47.6 bushels of soybeans per acre, compared to the county average of 110 bushels of corn and 34 bushels of soybeans per acre. Extension advisors estimate that the economic difference for 4-H youth is a \$70 gain per acre of corn and a \$60 per acre of soybeans.

In a more conventional 4-H garden project in Illinois, adults as well as youth have benefited from their association with 4-H. One Macoupin County family reported: "Because of a 4-H gardening school held last spring, our family planted and cared for 16 different fruits and vegetables in a 4,000 square-foot garden. An excellent growing season enabled us to preserve over 800 quarts of produce, saving over \$500 and gaining \$200 income from our roadside stand."

Missouri: Green Thumb Garden projects offered through 4-H EFNEP involved over 4,289 low income youth who grew their own gardens--planting, sowing and harvesting. The young people exhibited fresh and preserved vegetables at garden fairs, and were recognized for their achievements. A common theme for all participants was the enhancement of self-worth and self-confidence. All participants learned to appreciate the value of doing a good job. In looking at the economic benefits of the project, the gardens helped the youth and their families produce some of their own food supplies which cut the cost of the family food bills.

Florida: In Taylor County, 15 low income 4-H'ers participated in 12 training sessions on judging horticulture specimens. In Gadsden County, 30 4-H members planted a vegetable garden at a community park. County Extension staff and volunteer leaders worked with the 4-H'ers on production practices. In Calhoun County, a summer camping nutrition program for limited resource 4-H youth provided for 150 4-H youth learning about personal hygiene, foods and clothing.

Foods and Nutrition: A total of 722,024 projects were conducted this past year in the area of food and nutrition. Projects ranged from creating awareness to preparation and conservation.

In addition to the regular 4-H food and nutrition program, there are also about 640,000 youth currently participating in Extension's 4-H EFNEP program, primarily for low-income city youth. About half of the youth are from minority ethnic groups. As a result of the EFNEP program, youth are learning good nutrition practices, how to improve diets, and to utilize the food available to them.

Iowa: Involvement of boys in 4-H in food and nutrition programs continues to increase, from 648 in 1975 to around 1,000 currently, with steady increases each year. In one project, Webster County reported that 70 boys took 122 foods projects to the county fair!

Florida: A 4-H mobile classroom is a new approach being used in Florida to reach young people about careers, food and nutrition, ecology and other subjects. State Extension Service operates the "4-H Care-a-Van" after-school program and a "4-H City Safari" day camping program. 4-H is finding that the mobile classroom is sparking the interest of youth. Tests offered before and after use of the mobile classroom show an increase in learning of up to 70 percent.

Energy Education Program: There was an increase in energy education programs in FY 1979.

Wisconsin: More than 100,000 Wisconsin 4-H'ers are conducting home energy investigations as part of the new State pilot 4-H energy education project. Club members will rate the energy efficiency of their clothing and what clothes they will need to stay warm in winter. Project activities are geared toward energy savings on the farm as well as in the home, including not only activities such as preparation of meals, but others such as keeping animals comfortable, tuning up farm equipment, and making simple solar devices.

Utah: Leadership training seminars were held in each of the State's Extension districts. Agents and leaders learned how to conduct energy programs and how to utilize new resources. The training culminated in a summer 4-H community energy conference of some 200 agents, leaders, and 4-H club members. As part of the conference program, several counties developed community energy conservation projects. The projects included plans for producing alcohol in small engines, development of models for energy efficient homes and the sponsoring of a youth energy seminar and 4-H energy bike-a-thron.

Another energy program featured a State energy awareness contest. Winning contestants went on to demonstrate conservation measures at a series of energy fairs which were conducted by the Utah State Department of Energy. The State winner was awarded a scholarship to attend the Western 4-H roundup.

District of Columbia: The D. C. 4-H and youth program provided educational projects and activities to 41,315 youth during FY 1980. This was an increase of 346 over 1979 and reflects the delivery system of the new word system initiated in 1980. New audiences for 4-H members include Hispanic and Chinese as well as the Black youth in the District. Total of 3,200 youth participated in projects related to the environment and energy conservation.

Environmental Improvement and Conservation of Natural Resources: Nearly 700,000 boys and girls are involved in natural resource conservation programs.

Minnesota: 1750 of the 2300 4-H clubs are participating in community pride projects. The average club contributes an estimated 150 man hours of service annually in conducting clean-up campaigns, planting community gardens, restoring buildings and facilities, and other activities. Altogether, this contributed time is valued from \$525,000 to \$700,000.

Michigan: 4-H staff are working closely with schools in many States to provide environmental conservation education for youth. In Cass County, Michigan, staff provided resource people, materials for classroom use, and arranged a conservation field day at Michigan State University's Russ Forest. Topics covered were fire safety, wildlife, water quality, tree planting, insects, and general forestry. Approximately 425 students took part in the tour and reported positive educational experiences.

New York: Over 28,000 classroom youth were involved in one-day, on-site programs provided through Extension 4-H. The programs focused on conservation, preservation and responsible utilization of natural resources. Young people observed and learned about drainage, management of ponds, hillsides, swamps, woodlots, open fields for production, recreational and wildlife purposes. They also were also provided with information on fire prevention and control, aquatic life, outdoor safety and general ecological relationships.

Career Education Programs: There is emphasis on career exploration, youth employment, and economic understanding by the Extension agents, subject matter specialists and volunteers.

Connecticut: Career education experiences are provided to over 500 youths involved in the Hartford County, Connecticut 4-H orchard project. Profit-sharing, selling skills and the basics of fruit growing and management are stressed.

Kansas: In 1979, 1,845 youth were trained as a part of the Hazardous Occupations Safety program in Kansas. The purpose of this program is to qualify 14 and 15-year-olds to work safely around farm machinery, to learn safe machinery operation skills, to prepare youth to earn money for themselves, and to contribute to the agriculture production work force.

Since 1971, over 100,000 youth nationwide have completed this training course and have been certified to operate tractors and machinery for hire. Many small farm operators and commercial farmers depend on these teenagers during planting and harvesting seasons.

Washington: Grant County has a youth farm program now in its fifth year. The 4-H program has 10 acres of prime irrigated cropland. Twenty young people, mostly from low-income and minority groups, are employed each summer to raise truck garden produce, for which they are paid a minimum wage for 40 hours per week. The young people learn practical skills in farming, discipline of getting to work on time, value of work, and practical knowledge of producing, marketing, processing and community service.

Illinois: About half the counties in Illinois have conducted specific 4-H careers and economics program. Chicago provided an educational career program for 500 unemployed youth which gave teenagers incentives to learn more about themselves and how to get jobs. The counties worked directly with other youth agencies in carrying out this project. The counties also developed a 4-H careers program for traditional 4-H members.

Missouri: St. Clair county has conducted a 4-H careers day and has worked with inner-city youth in East St. Louis, Missouri, to giving agricultural-related job awareness to an urban audience. Kane County's resource days involve business leaders and high school aged youth. Carroll County has contacted every sophomore in high school with an annual Extension 4-H careers day program attended by 30 business leaders.

Michigan: Through leadership activities of 4-H professional staff members at Michigan State University, several Michigan counties have established and are operating career education programs through local 4-H Clubs including: (a) an employability skills development program for 4-H members who are

inner-city youth in Detroit; (b) a career exploration program for 100 inner-city youth involved in 4-H in Saginaw; (c) a "Careers for Kids" program conducted by 4-H personnel in the public elementary schools of Ingham County, Michigan, and reaching non-4-H members as well as 4-H members in these elementary schools; (d) a career exploration program in the Bay County 4-H Service Club that may eventually involve the local Jaycees "Take-a-Kid-to-Work" program; and (e) "Career Exploration Overnight" programs in Marquette and Alger Counties for 4-H members. Michigan State 4-H leadership staff appear to have been more active in working collaboratively with formal education system career education efforts than have some other States. The total set of career education opportunities for Michigan youth has been expanded because of the involvement of Michigan 4-H professional personnel in career education.

Community Development, Leadership and Citizenship: The 4-H program is based on the principle of individual development through education. It tends to improve citizenship understanding, strengthen leadership capabilities and improve the community.

In recent years, the rural 4-H model has proven itself valuable for development of urban low-income youth. Studies show that in inner-city, low-income areas where 4-H has been established, crime has subsequently decreased. It costs as much as \$17,000 per year to care for a young person in a public institution, compared to Federal government costs of about \$14 per 4-H participant.

Currently, about 24 percent of the youth enrolled in 4-H Clubs, 4-H special interest groups, and 4-H EFNEP come from minority ethnic groups.

Last year, there were 565,842 volunteer leaders--adults, juniors and teens--who assisted 4-H youth in their programs and activities. Estimated value of volunteer staff time in 4-H is over \$600 million per year. This contribution of volunteer time is one reason for the low cost of 4-H.

Alabama: Summer day camps are an important part of the Tuskegee Extension program for youth in Alabama. Primary purpose of the program is to provide leadership training, recreation, nutrition information, and career exploration. This program has grown from one county to 10 counties, providing some experiences for low-income youth that they would not normally get in school programs. Where camps have been held in the same area year after year, there have been marked improvements in grooming, cooperation, leadership abilities, knowledge of proper diets, safety habits, and knowledge of the environment. Adult volunteer leaders have also benefited from the camps. Last year, 1,500 youth participated in the 10 camps. At least 90 percent of the youth were from low-income families; 65 percent were not enrolled in an ongoing 4-H program. Some 95 adult leaders assisted in the program.

In another program, high school juniors and seniors attended a career field day at Tuskegee where young people explored some of the more technical career programs including agriculture, home economics, nursing, engineering, allied health and veterinary medicine. They were able to meet with representatives from the various departments to learn about careers, entrance requirements and personal qualities needed for success.

Ohio: Several Ohio counties designed programs to reach mentally retarded, handicapped and children's home youth. These programs are effective in helping these handicapped young people to develop to their potential. 4-H junior leaders who worked with the programs for handicapped children developed an increasing appreciation for children with special problems and the patience they need, as well as an appreciation for the progress they can make through help. Junior leaders indicate a feeling of self-worth and importance as a result of their helping relationship.

Kentucky: More than 4,500 older teenagers as volunteer 4-H club leaders have been recruited--strengthening the 4-H program and giving the teenagers an enriching leadership experience.

The State has put special emphasis on the senior teens as both project leaders in local clubs and as club leaders. Local adult leaders, county Extension professionals and the State 4-H staff all look for likely prospects among the older club members. Teen leadership is also encouraged by teen councils at the county, area and State levels--which send representatives to adult leader councils. The State features teen roundups--weekends in 4-H camp settings that offer training in both program areas and leadership. The State sent 236 representatives to a recent teen leader 4-H conference in Washington, D.C.

COMMUNITY AND RURAL DEVELOPMENT

Current Activities: Almost 1500 Extension staff years are devoted to community and rural development programs with the goal of providing communities, organizations, and local governments with reliable knowledge and information upon which effective public decisions may be made. Every state, Puerto Rico, Guam, the Virgin Islands and the District of Columbia conducts a community development educational program and nearly 10 percent of Extension's professional staff time is devoted to this area.

Efforts are expended in twelve components of community and rural development problems and concerns, but major program thrusts are concentrated in three areas: (1) improving the capacity or ability of communities and their governments to effectively deal with their problems; (2) developing economic resources; and (3) improving accessibility of essential community services and facilities.

To provide adequate information for public decisions, Extension collaborates with many action and regulatory agencies. Approximately 15 percent of community and rural development client contacts are represent state agencies; ten percent represent federal agencies at national, regional, state and local levels; and 16 percent represent local boards, commissions and jurisdictions. Local service clubs, locally organized development organizations and citizen groups comprise the other contacts.

Selected Examples of Recent Progress:

Capacity Building: Using traditional and improved communications technologies, Extension agents and specialists have been able to provide information and technical assistance to less than half of the 27,000 units of rural local governments. This assistance has included community studies, surveys and analyses; help in locating and utilizing local and external support resources; training in the social action processes; management of public finances and programs; cost-benefit analyses of public programs; and long range comprehensive planning. As a consequence, local governments are better prepared to cope with complex problems associated with spiraling costs and increased citizen demands for public services, compliance with federal and state regulations, and reduced public revenues.

An estimated 11,000 community leadership and organization projects are conducted annually by Extension. The activities consist of training and counseling citizens, groups and organizations in problem solving techniques and the principles of organization and the social action processes. As a result, some one-half million people are better prepared to deal more effectively with community problems and concerns.

Louisiana: In DeSoto Parish, Louisiana, Extension-CRD conducted community meetings for both parish leaders and persons with little or no formal education on factors affecting community growth and development. About 450 people

attended. Because of these training sessions, a bond issue was passed in one town, 27 miles of roads were improved, a parish advisory committee was formed, and better citizen rapport with elected officials was established.

Arizona: In Safford, Arizona, Extension initiated surveys, forums, media analysis and citizen action committees. In response to the needs identified, a \$1.5 million street improvement program was begun, the downtown area revitalized, telephone reassurance and transportation for the elderly developed, and a \$65,000 neighborhood park is underway.

Oklahoma, Florida and South Carolina: Extension is utilizing on-campus and remote computer terminals to assist local decisionmakers. Oklahoma assists 100 local entities a year to analyze budgets, utility rates, routings, facility locations and service feasibility for water districts, EMS services, fire departments, solid waste programs, and other community needs. South Carolina's computer programs help local officials understand the budget impacts on community facilities and services of economic development and job expansion programs. In Florida, decisionmakers and planners have used computer models to map strategies to achieve development goals; to study the probable impacts of a major housing subdivision in Okeechobee County; document and describe the role of the agriculture sector in the local economy as a growth management tool in dealing with the preservation of prime agriculture land; and to determine employment and income impacts for EDA funded programs.

Oklahoma: Extension developed a state-of-the-art report on various alternative methods for utility meter reading in local communities including the costs and benefits of each method and a directory of current users. Four thousand copies were distributed to local governments through the four regional Rural Development Centers. Cost savings over current manual methods are estimated at \$40,000 a year.

New York: Extension has undertaken an expansive training program for public officials in the area of real property taxation and assessment. Designed for newly elected officials, as well as incumbents, such training sessions acquaint local officials with current assessment techniques and with the latest information and technology for effective planning and zoning. Equitable taxation and improved cash flow are two immediate by-products.

Kansas: Extension assisted the Big Lakes Regional Council, comprising communities from a five-county area, in establishing a medical communications system designed to provide 2-way hospital/ambulance communication for improved regional emergency medical service.

Economic Development: The level of economic development in a community is the primary factor which determines the level of community services, facilities, recreation, etc., that a community can support. The impetus for increased Extension emphasis on economic development stems from inflation, unemployment, and declining investment returns and a shrinking tax base. Extension assistance programs are centered on improving and sustaining the economic base of the community; expanding trade and commerce, small business development, industrial development, and development of manpower resources. About 20 percent of the Extension community and rural development program is devoted to economic development.

Florida: Gadsden County, Florida, now has a thriving industrial-agricultural economy as the result of aggressive, effective actions by the Industrial Development Committee and the county Extension Service. Skillful use of survey information and analyses brought new industries to the area and new skills to the work force. In all, 35 new industries have been attracted to Gadsden County, with more than 2,000 new jobs added.

Georgia: This year (1980), marked the entrance of the University of Georgia Cooperative Extension Service into the field of computer-assisted business

development programs. The county staff holds a general informational meeting and then solicits input data from individual merchants. The data is computerized, analyzed and returned through the county agent's office to the client. Services range from assisting local entities conduct in-depth market surveys to working with merchants to provide a better understanding of business improvement alternatives.

Wisconsin: Community needs were identified and analyzed, and plans implemented to effectively use \$521,500 in private and public funds in a downtown improvement project in Athens, Wisconsin. The project was a joint effort between the Marathon County University of Wisconsin Extension and the Marathon County Planning Department. Improvement emphasis was directed at industrial development, downtown revitalization, parks and public utilities as identified by the local citizens. New leaders in the community were identified and they, along with existing leaders, enhanced their leadership capabilities. The town of Athens has now solved a major portion of its economic problems.

New York: In Seneca County, New York, an effort has been focused on developing the potential of agricultural opportunities. Program efforts have resulted in the opening of a farm winery, thus providing marketing alternatives for grapes and other fresh fruit, and also the opening of new refrigeration, packaging and storing facilities. Extension also cooperated with the state Department of Agriculture and the county Farm Bureau in setting up a state Transportation Advisory Committee to develop a state rural transportation plan. All of these cooperative efforts have been vital in bringing about agricultural economic development in Seneca County.

Kentucky: Over a long period of time, Kentucky Extension has played a prominent role in increasing income from tourism. It has provided studies, surveys, clinics, organizational assistance, and tourism development training. These efforts have supported and complemented those of other state and federal departments. The dividends have been impressive. Twelve years ago, the travel industry employed 15,000 people and accounted for \$316 million in receipts. Today, tourism is Kentucky's third largest industry employing over 120,000 people with combined receipts of over \$1.3 billion.

North Dakota: An \$80 million alcohol plant is being constructed in Hankinson, North Dakota, a community with a population of 1,150 located in the southeastern portion of the state. A \$17 million sunflower processing plant will also be constructed in the community. A letter to the Extension Service, accompanied by a front page story of the local newspaper, refers to the development as "fruits of rural business and industrial development course," conducted in the community in 1978. The development course is a cooperative effort involving a number of state and private organizations and agencies and is coordinated by the Cooperative Extension Service at North Dakota State University.

Community Services and Facilities: The reverse migration from urban to rural, "boom towns" in coal development and rapidly industrializing areas, and rural isolation have all accelerated the need and demand for increased levels and accessibility of community services and facilities. Local decisionmakers must cope with these increased demands on the one hand, and declining purchasing power of public revenues on the other. Extension is helping local governments and community groups seek ways of resolving this dilemma. Long range comprehensive planning; cost-benefit studies; computer assisted location, routing, and facility alternatives; and methods of public and private financing are all forms of Extension assistance to community decisionmakers.

North Dakota: County Extension staffs helped organize 21 rural water associations. Most of these are in sparsely settled communities. The associations are in various stages of development, with the ultimate goal of providing adequate and safe water to households.

Indiana: Recreational facilities were inadequate to accommodate needs in the northwest corner of the state, and no funds were available to alter the situation. The county agent, through his membership on the Park and Recreation Board, developed educational packages to explain to citizens the need and alternative solutions. As a result of citizen understanding and involvement, the county now has two parks that are fully utilized.

Arkansas: The Batesville area needed health services far in excess of what less than a dozen family physicians could provide. Extension held meetings and public discussions on this need. A Physician Search Committee was organized in an effort to attract medical school graduates or practicing physicians who might wish to relocate. The committee contacted 100 prospects and has now secured 10 new doctors, 5 dentists, 1 optometrist, and 1 chiropractor for the Batesville area.

Texas: Grass fires are frequent in Wildorado, a small rural community in the Texas panhandle, because of distances of volunteers from the firehouse and distances from the firehouse to the sites of the fires. Often two hours were lost and hundreds of acres were burned. With the help of Extension and working through a Texas Community Improvement Program, Wildorado began concerted effort to secure a water system. Three years later, they had a water system and an upgraded volunteer fire department. Women were trained to respond to the calls and to deliver firefighting equipment to sites, thus enabling the firefighters to report directly to the scene of the fire, saving lives, property and time.

Delaware: Extension is providing assistance in the incorporation of a county-wide profit housing corporation to develop and manage low to moderate income housing in rural Delaware. Over 70 percent of substandard houses are in the unincorporated areas of Sussex. There is no housing authority to remedy this situation. The county-wide development corporation will offer one additional housing supplier.

Florida: The Florida Cooperative Extension Service, cooperating with other agencies and institutions, is helping develop an alternate form of energy-wood gasification. A pilot plant will operate 12 months a year, instead of the current nine month operation forced by natural gas quotas.

HIGHER EDUCATION

The Food and Agriculture Act of 1977 established the Department of Agriculture as the lead agency in the Federal Government for food and agricultural sciences and included teaching, i.e., higher education in the food and agricultural sciences, as an area of responsibility of the Department. The Act, P.L. 95-113, authorized transfer of the administration of Section 22 of the Bankhead-Jones Act to the Department of Agriculture. In addition, the Act authorized establishment of competitive grants and fellowships for all colleges and universities for the purpose of furthering education in the food and agricultural sciences.

In an effort to be responsive to this legislation, the Office of Higher Education provides direction and national leadership to the Science and Education Administration's mission of strengthening formal education and training programs in the food and agricultural sciences. Appropriated Bankhead-Jones funds are administered by this office. Distribution of the grant payments under the Bankhead-Jones Act, by state, for fiscal year 1980 is given in Table 1. In addition, the Office of Higher Education is involved with joint planning and coordination of the broad programs of the Science and Education Administration, especially as these relate to extension, research, and teaching, as well as other higher education oriented activities related to the mission of SEA.

Current Activities: The Office of Higher Education has made a concerted effort to interface with representatives of universities and professional organizations across the nation for the purpose of identifying higher education related issues and concerns. The Office strived to articulate these matters on behalf of Colleges of Agriculture and Natural Resources, Home Economics, Veterinary Medicine, and Forestry, to the U.S. Department of Agriculture, the Congress, and to the public.

A major study was undertaken and a report compiled which analyzes supply/demand relationships in Agriculture, Natural Resources, and Veterinary Medicine. The purpose of this effort was to identify those academic areas which appear to warrant increased attention and support based on stable or expanding employment opportunities which exceed projected qualified graduates.

A Congressionally-mandated study of the Bankhead-Jones legislation was undertaken in cooperation with the Joint Planning and Evaluation unit. The report generated from this study was forwarded to the Congress in October of 1980.

The Office of Higher Education also coordinated the Department's participation in the Minority Research Apprenticeship Program for high school students. The objective of this program is to stimulate broader interest among minority students in careers in science and engineering and to establish contacts between students and active researchers who may become mentors when students need advice on colleges, and on careers, and need letters of recommendation.

Selected Examples of Recent Progress:

Interface with Cooperating Institutions and Organizations: The Office of Higher Education has worked closely with cooperators in the Resident Instruction Section of the Division of Agriculture, National Association of State Universities and Land-Grant Colleges (NASULGC), and the American Association of University Agricultural Administrators (AAUAA), to assist them in reorganizing their internal organizational structure to more effectively interface with agencies of the Federal Government.

Cooperators have assisted in identifying higher education related priorities for the Five Year Plan for Food and Agricultural Sciences.

Cooperating institutions and organizations were instrumental in identifying components of a national data base for use in planning, administering, and evaluating higher education in the food and agricultural sciences.

Analysis of Manpower Supply/Demand Relationships: Existing data were utilized to the fullest extent possible and additional data were collected as needed. These data were compiled into a comprehensive report entitled, "Graduates of Higher Education in the Food and Agricultural Sciences: An Analysis of Supply/Demand Relationships, Volume I, Agriculture, Natural Resources, and Veterinary Medicine." This document was published and has been distributed to appropriate institutions, organizations, and State and Federal Government entities. In brief, this report reveals that: "To strengthen the food/agriculture labor force, the United States needs more master's graduates in Agricultural Business and Management, Agricultural Engineering, Animal Sciences, Food Sciences, Natural Resources, Plant Sciences, and Soil Sciences. At the doctoral level, we need more graduates in Agricultural Business and Management, Agricultural Engineering, Animal Sciences, Food Sciences, Forest Engineering, Forest Products Utilization, Plant Sciences and Soil Sciences. In addition, this study projects shortages of graduates in selected specialties in Veterinary Medicine (for example, regulatory medicine, pathology)."

Bankhead-Jones Study: The study of the Bankhead-Jones legislation has resulted in a published report, "Review of the Bankhead-Jones Program: Final Report," which has been distributed to appropriate Federal and State entities, as well as appropriate university and professional organization cooperators. This report denotes these academic programs which have received support via these statutes and the manner in which the funds were used.

Minority Research Apprenticeship Program: The Department of Agriculture's participation in the Minority Research Apprenticeship Program, which was coordinated by the Higher Education Office, resulted in 165 minority youth participating in summer internships under the sponsorship of the USDA. The participating USDA agencies were: the Science and Education Administration, Forest Service, and the Economics and Statistics Service.

SCIENCE AND EDUCATION ADMINISTRATION
Technical Information Systems

Purpose Statement

The foundation of Technical Information Systems is the National Agricultural Library (NAL) unit which had its mission outlined by the Organic Act of 1862, establishing the Department of Agriculture. The act sets forth a mission, "to acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture in the most comprehensive and general sense of the word," and placed upon the Secretary the responsibility to "procure and preserve all information concerning agriculture which he can obtain by means of books..."

TIS has as its ultimate purpose the dissemination of useful information about agricultural and other related sciences to scientists and researchers, administrators and managers, farmers, and to the general public. In addition to providing traditional library services such as bibliographies, reference services and document delivery to agricultural scientists and researchers, TIS is expanding its role and serving a wider audience by using modern information dissemination technology to its fullest. Traditionally, the library has concentrated its thrust towards the agricultural scientist and researchers. The wider audience includes Federal, State and local administrators, as well as the farmer, the small businessman, public groups at all levels, and the general public.

With approximately 1.6 million volumes of printed material on agriculture and supporting scientific disciplines, TIS has one of the largest collections of its kind in the world. Both current and historical information is collected and organized for effective utilization by a wide range of users. TIS also provides input of U.S. publications to AGRIS, the International Information System for the Agricultural Sciences and Technology.

TIS operations are carried out at the National Agricultural Library Building at Beltsville, Maryland. Specialized services are provided from a branch library in Washington D. C., which includes the law collection and social sciences materials. Service is provided from these locations as well as 18 officially designated field libraries in the States and 30 "information" centers total approximately a quarter of a million volumes.

These libraries are situated at field locations where concentration of work and research staff warrants on-site library services. The Director of SEA prescribes library policy, standards, and procedure for these field library services and exercises such controls as are needed to coordinate services in the Department. The Administrator, SEA/TIS, implements these policies, standards and procedures.

As of September 30, 1980 the employment ceiling was 182 full-time permanent and 26 other than permanent, all located in Beltsville and Washington.

SCIENCE AND EDUCATION ADMINISTRATION

The estimates include proposed changes in the Language of this item as follows (new language underscored; deleted matter enclosed in brackets).

Technical Information Systems

For necessary expenses of the Technical Information Systems, /\$8,930,000/ \$9,381,000: Provided, That this appropriation shall be available for employment pursuant to the second sentence of section 706 (a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed \$35,000 shall be available for employment under 5 U.S.C. 3109: Provided further, That not to exceed /\$100,000/ \$500,000 shall be available pursuant to 7 U.S.C. 2250 for the alteration and repair of buildings and improvements. (Public Law 96-528, making appropriations for Agriculture- Rural Development, and related agencies, 1981).

The change in language is proposed to carry out much needed alterations on the National Agricultural Library (NAL) building not now possible under the \$100,000 current limitation. The facility is 10 years old and requires improvement and modifications. These include roofing repairs, building equipment, repair and/or replacement, updating of building safety systems, etc. The increased limitation will allow for much needed repairs to be undertaken.

TECHNICAL INFORMATION SYSTEMS

Appropriation Act, 1981.....	\$8,541,000
Budget Estimate, 1982.....	9,381,000
Increase in Appropriation.....	+840,000

Adjustments in 1981:

Appropriation Act, 1981.....	\$8,541,000
1981 Supplemental Appropriation for pay costs... 389,000	
Adjusted base for 1982.....	8,930,000
Budget Estimate, 1982.....	9,381,000
Increase over adjusted 1982.....	+451,000

SUMMARY OF INCREASES AND DECREASES
(on basis of adjusted appropriation)

<u>Item of Change</u>	<u>Increase or Decrease</u>		
	<u>1981 Estimated</u>	<u>Program Changes</u>	<u>1982 Estimated</u>
Increased Operating Costs	\$8,930,000	+451,000 ^{a/}	\$9,381,000
TOTAL AVAILABLE	<u>8,930,000</u>	<u>+451,000</u>	<u>9,381,000</u>

- a/ Includes a total increase of \$27,000 for the portion of pay increases effective in FY 1981 which were absorbed in FY 1981 but which are needed to carry out the programs proposed in FY 1982, and \$424,000 for increased costs of operations.

PROJECT STATEMENT
(on basis of adjusted appropriation)

Project	1980		1981(estimated)		1982(estimated)	
	Amount	Staff Years	Amount	Staff Years	In- crease	Staff Years
1. Agricultural Library Services for research and education:	:	:	:	:	:	:
	:	:	:	:	:	:
	:	:	:	:	:	:
	\$7,753,964	206	\$8,930,000	212	+451,000	\$9,381,000
	:	:	:	:	:	:
	:	:	:	:	:	:
Unobligated balance	163,036	- -	- -	- -	- -	- -
Total available or estimate	7,917,000	206	8,930,000	212	+451,000	9,381,000
Proposed supplemental for pay increase costs	:	:	:	:	:	:
Total, Appropriation	7,917,000	206	8,541,000	212		

EXPLANATION OF PROGRAM

The basic function of the Technical Information Systems (TIS) unit of the Science and Education Administration is to identify, acquire, disseminate and deliver pertinent food and agriculture information to all scientists, researchers, administrators, nutritionists, extension specialists, and others working in agricultural fields in both the government and private sectors. To meet user needs, TIS provides current awareness and retrospective searches on worldwide agricultural literature. These computer-based systems provide many different bibliographic data bases of interest to agricultural scientists and educators.

A national education and training program designed to inform actual and potential users of TIS about its operation, resources, and services has been initiated. The emphasis in this program is on the use of on-line bibliographic files and other computer services. TIS also is working closely to aid the 1890 college libraries in updating and improving their information services and products.

Acquisitions of agricultural materials continues to be a major activity in carrying out the mission of the Library component of TIS. Other primary activities for fiscal years 1981 and 1982 are as follows:

<u>Types of Activities</u>	<u>Estimated Productivity</u>	
	<u>FY 1981</u>	<u>FY 1982</u>
Serial Issues Added	222,000	220,000
Number of Titles Cataloged	15,000	16,000
Articles Indexed	100,000	100,000
Volumes Bound	20,000	18,000
Document Requests Filled	340,000	340,000
Reference Inquiries Answered	49,000	50,000
Automated Searches Conducted	12,000	10,000
Current Awareness System Profiles	26,000	28,000
Audiovisual Items Loaned	7,000	7,000

Organizing and announcing publications is a major objective of the program in bibliographic control. This includes cataloging books and journals newly acquired for the collection, and indexing journal articles, conference proceedings, and reports selected for their importance to agricultural research and education.

Resources of the collection are made available through direct loan, interlibrary loan of books, and photocopy of journal articles. Requests for documents from USDA field employees throughout the country are handled at the local level in cooperation with land-grant university libraries whenever possible, with TIS serving as a backup for document delivery.

TIS has expanded its services to all components of the agricultural community and the general public, through augmentation of its library and information network, and enhancements to the Current Research Information System (CRIS). Specific efforts are aimed at accommodating special research classifications; implementing revised classifications on human nutrition research; expanding the data base on acid rain; and developing research inventories and directories in selected fields.

TIS will focus its technical information program on three priority thrust areas of SEA: Human Nutrition, Alternate Energy Sources, and development of Aquacultural Food and non-Food Sources. The Food and Nutrition Information Center is expanding

its efforts in collecting, organizing and disseminating results of research on human nutrition. It is developing a nutrition information network with state Departments of Education, professional societies, and other nutrition information centers throughout the nation.

At the same time, TIS is planning to open additional channels of information dissemination through the Congressional Research Service; the Legislative Affairs Unit of SEA; and, the Visitor's Information Center of the Office of Governmental and Public Affairs, USDA. A new demonstration and teaching facility has been installed in the D.C. Library Branch of TIS to facilitate the transfer of information to USDA and other government agencies.

In addition to the preceding activities, SEA/TIS must also provide for collection preservation. This involves the microfilming and restoring of important documents, unbound serial issues, newspapers, and historical materials.

Justification of Increases

- (1) A net increase of \$451,000 for services consisting of:
 - (a) An increase of \$27,000 for FY 1981 pay increase.
 - (b) An increase of \$424,000 for Technical Information Systems for increased operating costs.

Need for Change. The increased funds are needed in order to maintain a current level of program effort. The costs of providing services has risen over the last few years especially for the purchase of books and journals, and the need to apply new technology. In fact, the cost of new publications is rising faster than the overall rate of inflation. Increased usage of on-line data bases coupled with an increase in demand for new services, such as the growth of the current awareness literature service, which in turn creates a greater demand in other areas such as document delivery service, have also contributed greatly to the problem.

Nature of Change. This increase would ameliorate the impact of inflation on non-salary operating costs enabling TIS to maintain the services it is currently providing.

Technical Information Systems

Status of Program

Technical Information Systems (TIS) is taking the initiative in responding to information needs associated with current and anticipated national concerns in such areas as alternate energy sources, development of aquacultural food and non-food sources, and human nutrition. Resources are being used in support of technical data using advanced technology.

In these and other areas requiring special emphasis, TIS is increasing cooperation and contacts with the research and extension components of the Science and Education Administration (SEA) and with other USDA agencies. It is also broadening its contacts with the Interior and Energy Departments, with the other two National Libraries (Congress and Medicine), and with the State land-grant and other institutions of higher learning, particularly the 1890 or minority-oriented schools.

Current Activities:

Integrated programs requiring cross-unit participation for success are being conducted through the continuing cooperation and interaction of three TIS units: the Library Operations Division (National Agricultural Library), the Information Systems Division, and the Educational Resources Division. The addition of new audiences last year to those scientists and researchers traditionally serviced by the NAL has encouraged entirely new projects based on the needs of these users which include extension personnel, nutritionists, non-land-grant institutions, and private industry.

One of the projects begun this year centers on the systematic inclusion of some 60-75,000 4-H and adult State Extension popular publications in the TIS master bibliographic data base. This unprecedented effort is a cooperative project of the State Extension Services, SEA Extension, and TIS. The project, when completed, will assure mutual accessibility, for the first time, to Extension publications by all states and the Federal government. The project should reduce or eliminate duplication of effort and waste of shrinking resources.

Another recent program targeted at potential client groups involves coordinated and broadened training and education in the use of the latest electronic means to access technical information stored in the TIS data bases. These bases include not only AGRICOLA, the master bibliographic file for the library, but also CRIS (Current Research Information). State and private nutritionists, school administrators, State extension specialists, and others are being encouraged to take advantage of the world's greatest storehouse of agriculture-related information (Current Awareness Literature Service).

Technical Information Systems also has begun cooperative planning to open additional channels of communication: (1) with Congress through the Congressional Research Service of the Library of Congress, (2) with the legislative affairs unit of SEA and (3) with the Visitors Information Center operated by the Office of Governmental and Public Affairs for USDA. The efficient transfer of agriculturally related information on legislative as well as scientific affairs among TIS and these other units is the objective, using the latest available tools and techniques for accessing technical information data bases through terminals, word processors, teleconferencing, etc.

The introduction of a demonstration and teaching facility in the D.C. Library Branch of TIS, centrally located in the USDA South Building is expected to have significant impact during the coming year on TIS outreach efforts. This facility will serve as the focal point for TIS educational activities designed to support other SEA and USDA components and agencies of the Department located in downtown Washington, D.C.

In areas of concern such as energy and aquaculture, and in communications outreach, TIS is shifting emphasis to reach broader and more varied audiences both within the Federal and State governments and the private sector.

Selected Examples of Recent Progress:

Energy. Two landmark agriculture-related energy publications and a new bibliographic file, all three created in cooperation with land-grant universities, were initiated in response to the acute national need for information on the development of alternate sources of energy. Solar Energy and Nonfossil Fuel Research: A Directory of Projects Related to Agriculture, 1980 prepared in response to Federal legislation includes Federal, State, private, and foreign projects scheduled for publication in early 1981, it is the second in a series of annual energy research compilations, with most projects accessible through the TIS Current Research Information System (CRIS data base). Energy for Agriculture: a Computerized Retrieval System was compiled by B. A. Stout and C. A. Myers of the Agriculture Engineering Department, Michigan State University. This publication is the basis for a new bibliographic sub-file with over 2,600 initial citations on energy literature added to AGRICOLA, the master bibliographic file of the TIS National Agricultural Library collection.

Aquaculture. TIS, through its Current Research Information System (CRIS), has established procedures for creating a sub-file of aquaculture research projects in CRIS. All ongoing and recently completed projects directly or indirectly related to aquaculture have been classified in subject categories. Eighty-four translations of important scientific and technical publications on this subject in foreign languages (particularly Japanese) were completed by TIS for the Interagency Committee on Marine Sciences and Fisheries. Lists of the translations were distributed to key USDA, Commerce, Interior, and land-grant program officers in aquaculture, as well as information officers, libraries, and State experiment station directors. TIS is working with the interagency group to greatly expand national and international technical information resources available to researchers, technicians, and farmers on the subject.

Agricultural Information Conference. In conjunction with the Annual Meeting of the National Association of State Universities and Land-Grant Colleges November 26-28, 1979, Technical Information Systems provided a discussion forum to explore the land-grant agricultural librarian information needs of agriculturists and ways in which cooperative systems make possible the integration of state and local information sources. A joint session with Agriculture Division, National Association of State Universities and Land-Grant Colleges provided an opportunity for administrators and information handlers to consider together implications for meeting the information revolution underway. The Conference program dedicated one morning to the subject of Cooperative Library Systems, particularly the creation of a national agricultural sciences information network.

Extension Publications Bibliographic Systems. Some 60-75,000 4-H and other State extension popular publications produced and used by the nation's State extension services in their educational programs are being included in the National Agricultural Library's master bibliographic data base.

The state extension services, SEA Extension, and SEA Technical Information Systems are working together on this massive project which will assure mutual accessibility for the first time to state publications among all states and by the Federal government. The project is designed to reduce or eliminate duplication of effort and encourage more efficient use of resources at both the Federal and state levels. The submission of 4-H and youth publications for the northcentral states should be completed by January 1, 1980, and additions of adult publications finished by July of 1982.

Electronic Mail. A national electronic mail network to meet the needs of the Extension Service is being set up by TIS based on the findings from a 1-year test. When the system is set up, it will be accessible to the entire SEA-state research and education community. Implementation of the system is scheduled for January 1981. It is anticipated this network will serve a wide variety of devices, including programmable terminals, word processing equipment, teletacsimile machines, and optical character readers providing not only communication services, but electronic filing and retrieval, data transmission, hard copy production and transmission services.

Education and Training. In support of its increased efforts to inform actual and potential users of TIS about its operations resources and services, TIS produced an 18-minute video tape, The Information Cycle, and a number of publications, including the TIS Guide to Services, Food and Nutrition Center, AGRICOLA (on the use of its Audiovisual Resources in Food and Nutrition, and 33 quick bibliographies on subjects of current concern to the public such as energy, volcanic ash, acid rain, minimum tillage, small farms, nutrition and aging, etc. Demonstrations of the AGRICOLA data base were held throughout the United States in cooperation with land-grant colleges and universities and professional societies.

International Input. As part of its expanded program for cooperation with AGRIS (International Information System for the Agricultural Sciences and Technology), TIS increased its contribution of citations from 12,000 input work sheets annually in fiscal years 1976-/7 to 50,000 machine readable records for 1978-1980 period. This increase makes the United States the most prolific of the AGRIS participants. Development of computer compatibility is the result of cooperative agreements with AID and is also enabling TIS to incorporate selected AGRIS citations for non-U.S. imprints with the AGRICOLA file.

Work with 1890 College Libraries. TIS has worked closely in the past few years to aid the Colleges of 1890 and Tuskegee (black land-grant) libraries in updating and improving their services. This includes the distribution of duplicate books and journal pieces, the introduction of on-line bibliographic searching, and the free distribution of photocopies of journal articles to agricultural researchers upon request. In the fall of 1978, NAL at a 3-day meeting in Huntsville, Alabama, with the 1890 college library directors, focused on agricultural information needs. As a result of this meeting, the library directors have been meeting twice yearly since 1979 and Federal legislation has been proposed to aid in the development of local agricultural library information services.

Food and Nutrition. The TIS Food and Nutrition Information Center (FNIC) reached nearly 1.5 million persons in FY 1980 through its audiovisual lending program with films, tapes, slides and other educational aids shown in classrooms and before citizen groups. Requests for reference services tripled from 565 to 1,546 with schools, State departments of education, universities and colleges, private industry, hospitals, Congress, and other Government agencies as major users. Outreach and demonstration of on-line computer searching has increased contacts with over 4,000 dietitians and nutritionists. Fifty-nine presentations were given, and three bibliographies prepared on Dietary Guides and Dietary Guidelines, Nutrition and the Elderly, and Maternal and Infant Nutrition.

Visitors. A total of 520 visitors, including 129 from foreign countries were given tours of or briefings at the NAL Building during the 5-month period from May through September 1980. This is almost double the 295 persons, including 139 from other countries, who visited the building to learn about Technical Information Systems during all of 1979. TIS missions and services were explained to scientists, librarians, and technical information specialists from the Peoples Republic of China, (31), Brazil, Israel, Bulgaria, Bangladesh, India, Yugoslavia, New Zealand, Australia, Guadelupe, Germany, England, France, and other countries.

Lending. There was a significant improvement FY 1979 in the efficiency of TIS document delivery service. Over 80 percent of requested items were processed and on their way in five or less working days from the time of initial receipt of request. A sampling indicated that from June 1 through August 31, 1980, an average of 83.5 percent of all requests received were completed in 5 or less working days compared with an average of 64.2 percent completed in the same 3-month period in 1979. TIS lends or photocopies (in lieu of loan) more than 100,000 items from its collections each year and considers the service efficient if 80 percent of the requested items are processed and sent out in five or less working days. Some 3,500 more requests were handled with less man power in FY 1979.

SCIENCE AND EDUCATION ADMINISTRATION

The estimates include proposed changes in the Language of this item as follows (new language underscored; deleted matter enclosed in brackets).

Buildings and Facilities

For acquisition of land, construction, repair, improvement, extension, alteration, and purchase of fixed equipment or facilities of or used by Agricultural Research, where not otherwise provided, \$1,900,000 for the establishment of the European Parasite Research Laboratory, Valbonne, France.

The change will provide language for the authority to undertake the acquisition of land, planning and construction of the European Parasite Research Laboratory, Valbonne, France.

Science and Education Administration
 Agricultural Research

Status of Construction Projects as of December 1980

Status of research facilities authorized in prior years, and reported as uncompleted in the 1981 Explanatory Notes, is as follows:

NOTE: (Design criteria provided by AR to specify the program requirements and form the basis for negotiation of architect-engineer contracts. Diagrammatic drawings or concept drawings provide the basis for the first review of the architect's design. Tentative drawings or architect's design are provided by the architect for firming up cost estimates and basis for developing the completed, and final working drawings.)

Location and Purpose	Year	Funds Provided Amount	
Colorado, Fort Collins Animal Disease Center	1979	Plans.....\$ 700,000	Design criteria will be completed in the second quarter of fiscal year 1981.
Indiana, West Lafayette Soil Erosion Center	1978	Plans..... 400,000	
	1979	Construction.... 3,600,000	Architect's design was completed in the fourth quarter of fiscal year 1979.
	1979	Supplemental.... 720,000	Construction contract was awarded in the second quarter of fiscal year 1980.
	Total	<u>4,720,000</u>	Construction completion is projected to be in the third quarter of fiscal year 1981.
Massachusetts, Boston Adult Human Nutrition Laboratory	1978	Plans..... 2,000,000	AE contract was awarded in fourth quarter of fiscal year 1978.
	1979	Construction.... 21,100,000	Architect's design was completed in the fourth quarter of fiscal year 1979.
	1980	Redirection.... 2,187,000 f/ Total <u>25,287,000</u>	Construction contract for phase I (site work and excavation) was awarded in the first quarter of fiscal year 1980.
			Construction completion is projected to be in the third quarter of fiscal year 1982.

Status of Construction Projects as of December 1980 (Cont.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Funds Provided Amount</u>
<u>New York, Plum Island Additional Animal Laboratory Facilities</u>		
1973 Plans.....	\$ 250,000	
1976 Construction....	10,000,000	
1977 Redirection.....	294,000 b/	
1977 Redirection.....	700,000 c/	
1978 Redirection....	900,000 d/	
1981 Construction....	10,100,000	
Total	<u>22,244,000</u>	
		Construction of facility was halted in March 1979 due to default of the contractor. Construction management consultant completed reassessment of the entire project and costs for completing construction with alternates in the second quarter of fiscal year 1980. Additional FY 1981 funds will permit award of design contract in FY 1981 and award of construction contract in FY 1982 for completion of the entry and change facilities, animal facilities, and the diagnostic research laboratory.
<u>North Dakota, Grand Forks Human Nutrition Research</u>		
1976 Plans.....	225,000	
1978 Construction....	3,500,000	
1980 Redirection....	389,000 g/	
Total	<u>4,114,000</u>	
		AE contract was awarded in the fourth quarter of fiscal year 1978. Architect's design was completed in the third quarter of fiscal year 1979. Invitation of construction bids resulted in all bids exceeding funds available. Architect's redesign of a building of reduced scope was completed in the third quarter of fiscal year 1980. Construction contract was awarded in the fourth quarter of fiscal year 1980. Construction completion is projected to be in the first quarter of fiscal year 1982.

Status of Construction Projects as of December 1980 (Cont.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Funds Provided Amount</u>	
<u>North Dakota, Fargo</u> <u>Headhouse/greenhouse</u>	1980 Construction.....	1,200,000	Design criteria were completed in the second quarter of fiscal year 1980. Design and construction contract by the University of North Dakota was completed in the third quarter of fiscal year 1980. Construction contract was awarded by the University of North Dakota in the third quarter of fiscal year 1980. Construction completion is projected to be in the third quarter of fiscal year 1981.
<u>Oklahoma, El Reno</u> <u>Feed Mill Replacement</u>	1978 Construction...\$ 1,500,000 a/ 1979 Construction... 300,000 1980 Construction... 1,000,000 Total 2,800,000		Construction contract was awarded in the first quarter of fiscal year 1980. Construction completion is projected to be in the first quarter of fiscal year 1982.
<u>Oklahoma, Stillwater</u> <u>Headhouse/greenhouse</u>	1979 Plans.....: 170,000 1980 Construction... 1,700,000 1981 Construction... 1,000,000 Total 2,870,000		AE contract was awarded in the fourth quarter of fiscal year 1979. Architect's design was completed in the third quarter of fiscal year 1980. Construction contract was awarded in the fourth quarter of fiscal year 1980. Construction completion is projected to be in the first quarter of fiscal year 1982.
<u>Texas, Lubbock</u> <u>Plant and Moisture</u>	1978 Feasibility Study.....: 100,000 1979 Plans.....: 800,000 Total: 900,000		AE contract for design criteria document was awarded in the second quarter of fiscal year 1980 and completed in the fourth quarter of fiscal year 1980. The design contract for the central laboratory was awarded in the fourth quarter of fiscal year 1980.

Status of Construction Projects as of December 1980 (Cont.)

<u>Location and Purpose</u>	<u>Years</u>	<u>Funds Provided Amount</u>
<u>West Virginia, Beckley</u> <u>Soil and Water Conservation Research</u>	1972 Plans..... 1973 Construction... 1976 Redirect... 1977 Redirect... 1981 Construction... Total.....	70,000 700,000 e/ 1,509,000 c/ 1,000,000 <u><u>3,319,000</u></u>

Construction contract was awarded in the third quarter of fiscal year 1978. Construction completion was in the second quarter of fiscal year 1980. Additional funds in FY 1981 will permit establishment of storage facilities to protect farm and research equipment. Award of contract to be accomplished in FY 1981.

West Virginia, Kearneysville
Fruit Crops Research

1973 Plans.....	\$ 200,000
1976 Construction... 1977 Redirect... Total	7,570,000 -2,209,000 <u><u>5,561,000</u></u>
	c/

AE contract was awarded in the first quarter of fiscal year 1974. Architect's design was completed in the fourth quarter of fiscal year 1976. Construction contract was awarded in the second quarter of fiscal year 1977. Construction contract was completed in the fourth quarter of fiscal year 1979. (Beneficial occupancy of facility was in May 1978.)

Wisconsin, Madison
Dairy Forage Research Center

1978 Plans.....	1,100,000
1979 Construction... Total	9,000,000 <u><u>10,100,000</u></u>
	c/

This facility is located on Baraboo field site (military base). AE contract was awarded in the fourth quarter of fiscal year 1978. Architect's design was completed in the third quarter of fiscal year 1979. Construction contract awarded in fourth quarter of fiscal year 1979. Construction was completed in the fourth quarter of fiscal year 1980.

University of Wisconsin campus site: drawing received the first quarter of fiscal year 1979. Architect's design was completed in the fourth quarter of fiscal year 1979. Construction contract awarded in the first quarter of fiscal year 1980. Construction completion will be in the second quarter of fiscal year 1981.

Footnotes:

- a/ Planning funds were not appropriated separately, but are included in the funds appropriated for construction.
- b/ \$194,000 were redirected from the air pollution abatement and sewage treatment project to provide funds for pollution abatement facilities in the animal and laboratory project as originally planned. An additional \$100,000 has been redirected into the animal and laboratory project from program funding.
- c/ Due to cost escalation and to provide funds to complete facilities as originally planned and designed at the Beckley, West Virginia project and the Plum Island animal and laboratory project, funds were redirected from Kearneysville, West Virginia.
- d/ Program funds in the amount of \$900,000 were reprogrammed to finance additional costs for this project.
- e/ Due to cost escalation, funds for the Ithaca, New York, project were redirected to Beckley, West Virginia, to provide sufficient funds to construct the facility.
- f/ Due to inflation and cost escalation, \$2,187,000 was redirected from program funds to finance additional costs for this project.
- g/ Human Nutrition reprogrammed \$389,000 to accept two alternates.

Passenger Motor Vehicles

The 1982 Budget Estimate does not include the purchase of additional passenger motor vehicles to its 472 passenger motor vehicles.

The passenger motor vehicles of this Agency are used by research scientists and staff personnel in the course of their daily work. These vehicles are operated chiefly at field stations engaged in research. These vehicles are used in travel where the use of common carriers is seldom feasible. This involves travel to individual farms, ranches, commercial firms, cooperating experiment stations, etc. The vehicles are essential for collecting experimental data and materials necessary for facilitating research work.

It is SEA's policy to pool the use of motor vehicles to keep the number of vehicles to a minimum and reduce overall costs for maintenance.

Replacement of passenger motor vehicles. Replacement would be made of 118 of the 472 (including 8 buses) passenger motor vehicles operated at field stations engaged in research. It is estimated that all of the 118 passenger vehicles to be replaced will have mileage of more than 60,000 or be 7 or more years old.

Age and Mileage Data for passenger-carrying vehicles on hand as of September 30, 1980.

Age-Year Model	Number of Vehicles*	Percent of Total	Lifetime Mileage (thousands)	Number of Vehicles*	Percent of Total
1975 or older	219	47	80-100	33	7
1976	39	8	60-80	86	18
1977	40	8	40-60	112	24
1978	66	14	20-40	99	21
1979	39	8	Under 20	142	30
1980	69	15		—	—
Total....	472	100		472	100

* Includes 7 vehicles used in foreign countries, and 8 buses.

Aircraft

There will be no additional or replacements made of any of the seven aircraft owned by this Agency in FY 1982. These aircraft are located at College Station, Texas, Weslaco, Texas, and Yakima, Washington. They are used in control methods, application of agricultural materials, infrared and color photography, and evaluating effects on weather conditions.

